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COMMONWEALTH MYCOLOGICAL INSTITUTE

REVIEW
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LYRE (H.). **Die Bekämpfung der Blattfleckenkrankheit und Vergilbung im Rübenbau.** [The control of the leaf spot disease and yellows in Beet cultivation.]—*Mitt. dtsch. landw. Ges., Frankfurt*, 69, 28, pp. 669–670, 1954.

On 28th July, 1952, copper oxychloride at the high concentration of 5 kg. per ha. in 800 l. water was applied to E and Polybeta sugar beets in the Einbeck district [near Hamburg], Germany, for the control of the steadily increasing leaf spot (*Cercospora* [*beticola*: *R.A.M.*, 34, p. 121]). The treatment raised the root yields of the susceptible E variety from 396 to 484 doppelzentner [1 dz. = 100 kg.] per ha. and those of the resistant Polybeta from 424 to 430, the corresponding increases in sugar being from 67·2 to 85·4 and 78·8 to 81 dz., respectively. The untreated E plots were severely attacked by leaf spot, the incidence of which was substantially reduced by spraying, though the plants were by no means free from infection and at least one more application would have been desirable. In 1953, when the effects of two treatments (on 21st July and 13th August) with copper oxychloride at the same rate were compared with those of one (on the former date) and none, the leaf yields in the plots sprayed twice, once, and untreated were 448, 390, and 320 dz. per ha., respectively, the roots 510, 494, and 446, and sugar 93, 88·4, and 77·6. These large increases are considered to afford ample compensation for the cost of spraying, which ranges from DM. 25 to 30 per ha., corresponding to the market value of 4 to 4·5 dz. of beets. No differences in the adhesive properties of copper oxychloride and copper oxide were observed in comparative tests.

Direct control of beet yellows virus [34, p. 12] is impracticable, but very early sowing and close spacing will produce a dense, compact stand which is relatively resistant to aphid invasion. In the local spraying experiments against leaf spot in 1952, an insecticide of the hexa group was added to the copper mixture, resulting in an incidental reduction of yellows in fodder beets. In a repetition of the test in 1953, using 5 kg. copper oxychloride and 300 gm. lindane [cf. 32, p. 356] in 800 l. water per ha., the leaf yields of fodder beets were raised from 134 dz. per ha. to 156 by one treatment on 21st July and to 190 by two applications, the second on 13th August, the corresponding figures for roots being from 796 to 874 and 960, respectively, and for sugar from 76·8 to 86·52 and 100·8. The additional outlay of DM. 5 to 7 per ha. on the insecticide does not detract unduly from the profitability of the treatment.

SØRGEL (G.). **Über den Entwicklungsgang von Mycosphaerella pinodes (Berk. et Blox.) Stone. II. Der Einfluß der Wasserstoffionenkonzentration auf die Ausbildung der Fortpflanzungsorgane.** [On the development of *Mycosphaerella pinodes* (Berk. & Blox.) Stone. II. The influence of the hydrogen-ion concentration on the development of the reproductive organs.]—*Arch. Mikrobiol.*, 19, 4, pp. 372–397, 2 figs., 17 graphs, 1953. [Received February, 1955.]

In further studies at the Plant Breeding Institute, Quedlinburg, Germany, the

development of the several reproductive organs of *Mycosphaerella pinodes*, an agent of foot rot of peas [*R.A.M.*, 34, p. 122], was found to be dependent on the hydrogen-ion concentration of the 1 per cent. pea decoction medium. Thus, an acid reaction (pH 5) was the most favourable for pycnidial production, which reached a maximum number of 2,659 per dish after 168 hours, while pseudothecia were most abundant at a neutral one (pH 7), with a peak of 13,920 at the same time. Alkalinity (pH 8) resulted in a remarkable stimulus to chlamydospore development, culminating in 15,764 after 190 hours. A decrease in acidity was accompanied by delay in the inception of production of the organs and a reduction in their size, and the more alkaline the medium became, the more extensive was the development of aerial hyphae. The shift in the pseudothecial phase with declining acidity did not occur so rapidly as that of the pycnidial, and the two phases merged at an alkaline reaction. An abrupt change in the hydrogen-ion concentration may result in the development of pseudothecia from pycnidial primordia and vice versa.

Sylvester (E. S.) & Severin (H. H. P.). **Virus diseases of Sugar Beets in California.**—*Circ. Calif. agric. Ext. Serv.* 422, 12 pp., 12 figs. (4 col.), 1953.

Notes are given in semi-popular terms on six virus diseases of sugar beet found in California, viz. curly top (the most important) [*R.A.M.*, 33, p. 400], mosaic [32, p. 56; cf. 33, p. 331], western cucumber mosaic, yellow net [loc. cit.], yellow vein, and yellows [33, p. 400].

Skotland (C. B.) & Hagedorn (D. J.). **Aphid transmission of the Wisconsin Pea streak virus.**—*Phytopathology*, 44, 10, pp. 569–571, 1954.

The pea aphid (*Macrosiphum pisi*) [*Acyrthosiphon pisum*] was found to be an inefficient vector of the Wisconsin pea streak virus [*R.A.M.*, 30, p. 300], giving very low percentages of transmission in a greenhouse at a temperature of 20° C. throughout the investigations herein described. A very slight increase in capacity for transmission was effected by starving the aphids for one to two hours before allowing them to feed on infected plants, while plants showing the more severe late symptoms of the disease proved to be better sources of the virus than those in the earlier and milder stages. No enhancement of efficiency resulted from extending the acquisition period from one to 24 hours or from the use of aphids in different phases of development. The virus was conveyed by *A. pisum* from pea to red clover and broad bean and from red clover and *Melilotus officinalis* to pea. In 400 tests on series of four plants each *A. pisum* consistently failed to transmit the virus to the fourth plant and in no case did more than one plant in a series contract infection, suggesting that Wisconsin pea streak belongs to the non-persistent group.

Rudorf (W.). **Die Übertragung der Resistenz gegen die Bohnenmosaik-Viren 1 (gewöhnliches Bohnenmosaik) und 2 (gelbes Bohnenmosaik) aus Phaseolus coccineus in fertile Bastardpflanzen aus der Kreuzung Phaseolus vulgaris × Phaseolus coccineus.** [The transmission of resistance to Bean mosaic viruses 1 (common Bean mosaic) and 2 (yellow Bean mosaic) from *Phaseolus coccineus* to fertile hybrid plants from the cross *Phaseolus vulgaris* × *Phaseolus coccineus*.]—*Naturwissenschaften*, 42, 1, pp. 19–20, 1955.

Whereas the Great Northern U.I. 15 and 123 and BO 19 bean (*Phaseolus vulgaris*) varieties react to inoculation with the Voldagsen strain of bean mosaic virus [*R.A.M.*, 33, pp. 8, 517] by extreme resistance, expressed by the symbol r_i, none of the many varieties tested at the Max Planck Breeding Research Institute, Voldagsen, Hanover, with the local strain of bean yellow mosaic virus gave a comparable response. It was observed, however, that the Weisse Riesen and Rote

Prunk varieties of *P. coccineus* developed the r_i reaction to mechanical inoculation with both viruses. In experiments on a large number of F_4 and F_5 families of crosses between *P. vulgaris* and the above-mentioned varieties of *P. coccineus*, complete susceptibility was the most frequent reaction, though there were some cases of r_i and others characterized by acronecrosis and total necrosis with their well-known symptoms.

Studies on the genetics of the r_i response were impracticable at first on account of the high degree of sterility in the F_1 of the *P. vulgaris* × *P. coccineus* cross but can be undertaken with the fertile descendants now available.

ANDERSEN (A. L.) & DOWN (E. E.). **Inheritance of resistance to the variant strain of the common Bean mosaic virus.**—Abs. in *Phytopathology*, 44, 9, p. 481, 1954.

Resistance to a variant strain of bean [*Phaseolus vulgaris*] mosaic virus in the U.S. No. 5 Refugee variety and the Mexican introduction Trag 279–1 appeared from the results of studies [at the Michigan State College] on the F_1, first back-cross, and F_2 generations of crosses between them and six susceptible varieties, including Michelite, Cranberry, and Dark Red Kidney, to be controlled by a single dominant gene in the resistant parents. On the other hand, crosses between the resistant Great Northern U.I. 31 and the six susceptible varieties produced two distinct types of reaction, depending on the degree of resistance of the susceptible parent, resistance being governed by either a dominant or recessive gene.

SCHNATHORST (W. C.). **Bacteria and fungi in seeds and plants of certified Bean varieties.**—*Phytopathology*, 44, 10, pp. 588–592, 1 fig., 1954.

Isolations at the University of Wyoming from seeds and plants of four varieties of Idaho certified bean (*Phaseolus vulgaris*), viz., Great Northern (University of Idaho) Nos. 16 and 123 and Pinto U.I. Nos. 78 and 111, yielded a number of bacteria, four strains of *Rhizoctonia* [*Corticium*] *solani*, and species of *Alternaria*, *Fusarium*, *Stemphylium*, and *Sporotrichum*. Information on the last-named has already been presented [*R.A.M.*, 34, p. 272].

None of the bacteria was visibly pathogenic to soy-bean, *Melilotus officinalis*, *P. lunatus* var. *limenanus*, Black Valentine bean, or Blackeye cowpea, all of which, however, were attacked with varying severity by the several isolates of *C. solani* (one of which was tested at 75° and 85° F. and the rest at the former temperature only). The symptoms included complete decay of the seeds, dark brown lesions on the stems at or near soil-level, and foliar necroses ranging from small, circular spots to large rotted areas.

MENZIES (J. D.). **Effect of sprinkler irrigation in an arid climate on the spread of bacterial diseases of Beans.**—*Phytopathology*, 44, 10, pp. 553–556, 1954.

The effect of overhead sprinkler irrigation on the incidence of common bacterial blight (*Xanthomonas phaseoli*), halo blight (*Pseudomonas* [*medicaginis* f.sp.] *phaseolicola*), and bacterial wilt (*Corynebacterium flaccumfaciens*) of bean [*Phaseolus vulgaris*] and bacterial leaf spot (*Pseudomonas syringae*) of Lima bean [*Phaseolus lunatus*] was investigated in the arid climate of the Columbia Basin region of Washington [*R.A.M.*, 31, p. 416], special attention being paid to the first-named disease. The diseases do not occur on crops irrigated by the furrow method, but all have developed late in the season on sprinkled fields. Using artificially established infection centres in fields sprinkled for varying periods, practically no spread of bacterial blight took place during July and August with up to 30 hours of continuous irrigation. With approaching maturity of the crop in September *X. phaseoli* tended to develop rapidly, but at this stage the damage was negligible. It appears, therefore, that under local climatic conditions there is little danger of

serious outbreaks of bacterial bean diseases resulting from overhead sprinkling provided the crops are planted early enough to mature before October.

Burkholder (W. H.). **Three bacteria pathogenic on Head Lettuce in New York State.**—*Phytopathology*, 44, 10, pp. 592–596, 1 fig., 1954.

Studies on the rots of head lettuce caused by *Pseudomonas cichorii* [*R.A.M.*, 28, p. 56; 31, p. 165], *P. marginalis* [loc. cit.; 31, p. 531], and *Xanthomonas vitians* [22, p. 346] are reported from the Department of Plant Pathology, Cornell University, Ithaca, New York. The cultural and physiological characters of the organisms were found to agree with their original and amended descriptions. Both *P.* spp. reduce nitrates to nitrites in a synthetic nitrate solution, but the results of tests in a nitrate broth were frequently negative. *P. marginalis* differs from the descriptions of *P. aeruginosa* [32, p. 377] and is regarded as a valid species. Both *P. marginalis* and *P. cichorii* proved to be pathogenic to potato tubers (*Trans. Brit. mycol. Soc.*, 25, pp. 215–216, 1941), onion bulbs, and cabbage heads, while the latter species also caused a leaf blight of iris and a wilt of bean [*Phaseolus vulgaris*] seedlings. *Pseudomonas intybi* [*R.A.M.*, 5, p. 275] is considered to be a synonym of *P. marginalis*, while *X. lactucae* [16, p. 297; 22, p. 346] and *X. lactucae-scariolae* [16, p. 584] are assumed to be identical with *X. vitians*. The close cultural similarity between *P. cichorii* and *P. viridiflava*, a bean pathogen [14, p. 16], suggests that they too may be one and the same species.

Yamaguchi (M.), Zink (F. W.), & Spurr (A. R.). **Cracked stem of Celery.**—*Calif. Agric.*, 7, 5, p. 12, 1 fig., 1953.

In field trials at Salinas, Monterey County, California, for the control of celery cracked stem due to boron deficiency [*R.A.M.*, 34, p. 73], using the Utah 10-B variety, sprays of 1·5 per cent. solution of boric acid alone and plus 800 lb. potassium fertilizer, in addition to a basic dressing of nitrogen, phosphorus, and potassium in the ratios of 500 : 208 : 104 lb. per acre, reduced the incidence of cracked stem from 5·2 (check) to 0·5 and 2·1 per cent., respectively, but the same amount of potash without boric acid induced 23·6 per cent. of cracked stem. At Brentwood, Contra Costa County, high nitrogen (400 lb.) and potash plus nitrogen (600 : 400), in addition to 10 tons farmyard manure per acre, significantly increased the disorder from 1 per cent. to 10·9 and 19·9 per cent., respectively. In a varietal trial at Brentwood, Utah 52–70 and Summer Pascal remained resistant.

Bolhuis (G. G.). **La culture de l'Arachide en Indonésie.** [The cultivation of the Groundnut in Indonesia.]—*Oléagineux*, 10, 3, pp. 157–160, 5 figs., 1 map, 1955.

The main problem in groundnut cultivation in Java is still bacterial wilt (*Bacterium* [*Pseudomonas*] *solanacearum*) [*R.A.M.*, 32, p. 546]. *Cercospora* disease [*C. arachidicola* and *C. personata*: 31, p. 101] may reduce yields by 15 per cent., but usually appears only at the end of the season. After World War II the virus diseases mosaic [cf. 31, p. 545], witches' broom [31, p. 165], and 'krupuk' [leaf curl] caused losses near Bogor. Native farmers, apparently, do not attempt to practise disease control.

The Schwarz 21 variety [30, p. 95; 32, p. 547] is now grown in all parts of Java, and has made groundnut cultivation possible in areas where previously the native varieties had almost disappeared as a result of infection by *P. solanacearum*. During the Japanese occupation Schwarz 21 became mixed with other varieties, and afterwards selection work had to be started again. The hybrid Gadjah, obtained from a cross between Schwarz 21 and an imported line, was found satisfactory for replacement purposes. No hybrid resistant to bacterial wilt could be obtained without employing a line of Schwarz as parent.

ELLIS (D. E.). **Scab of summer Squash in North Carolina.**—*Spec. Circ. N.C. agric. Exp. Sta.* 18, 11 pp., 2 figs., 1 diag., 1953.

The results of three years' experiments in the control of scab (*Cladosporium cucumerinum*) of summer squash (*Cucurbita pepo*) in North Carolina [*R.A.M.*, 30, p. 504] are presented. A spray is recommended comprising 2 qts. nabam and 1 lb. zinc sulphate per 100 gals. water to be applied twice weekly from three weeks of age until harvest is complete. Squash should not be grown on the same land more than once in two years. The seed may be treated, as an added precaution, in 1 in 1,000 mercuric chloride solution for ten minutes, washed in several changes of water and, after drying, treated with a thiram dust.

C. cucumerinum also attacks cucumber, and is more difficult to control by spraying due to the low habit of the vines. Pickling cucumbers resistant to scab have been developed [32, p. 360], and work is in progress to breed resistant market cucumbers.

STALLIER (B. B.). **Trace elements for Mushroom culture.**—*M.G.A. Bull., 1953*, 39, pp. 78–85, 1953.

It is stated that mushroom yields are generally increased by the addition of trace elements to synthetic straw composts made from inorganic nitrogen sources. Increases in yield with manure composts, however, depend on the size of the crop. If usually low, it may be increased by trace elements.

LUXMOORE (M. C.). **A question of preservation.**—*M.G.A. Bull., 1953*, 38, pp. 44–45, 1 fig., 1953.

To protect mushrooms from the injurious effects of gases released from creosoted woodwork the author suggests thorough ventilation, removal of crystals to prevent their falling on the bed below, washing of all exposed woodwork with a solution of ferrous sulphate and water, and protecting the lower bed with paper or a sheet of thin asbestos that can be moved from bay to bay.

REFFSTRUP (K.). **Salt v. Dactylium.**—*M.G.A. Bull., 1953*, 40, p. 109, 1953.

An effective control of *Dactylium* [spp.] on mushrooms by applying a layer of fine salt (sodium chloride) to *Dactylium* spots without removing any infected mushrooms or soil is reported and recommended from Oslo. In the treated spot the attack was stopped and by applying salt to all new spots each morning all the beds were free from *Dactylium* in about a month. Since then occasional single spots have been stopped by the same means.

DROUINEAU (G.) & MAZOYER (Mlle R.). **Toxicité du cuivre et évolution des sols sous l'influence des antiparasitaires.** [Copper toxicity and evolution of soils under the influence of fungicides.]—*C. R. Acad. Agric. Fr.*, 39, 7, pp. 390–392, 1953.

In soils which have absorbed copper fungicidal residues the possibility of local acidification due to the use of elemental sulphur warrants investigation because of the pronounced effect of lowered pH on copper toxicity. So far the latter has been observed only on annuals (spinach) and gladiolus. When deep trenching has transferred the accumulated residues to the rhizosphere of fruit trees or vines the combined effects of the two fungicides will have to be studied in new plantations.

ANNE (P.) & DUPUIS (M.). **Toxicité du cuivre à l'égard de quelques plantes cultivées.** [Copper toxicity with reference to some cultivated plants.]—*C. R. Acad. Agric. Fr.*, 39, 2, pp. 58–60, 1953.

Studies at the Chemical Research Station, Colmar, France, on the effects of

copper distributed homogeneously in the soil of potted seedlings of various plants demonstrated that in acid soils vines are sensitive to copper concentrations of the same order as those normally encountered, as a result of continued spraying with copper fungicides, in the soils of vineyards. In nature, however, the copper content decreases inversely with the depth of soil, which probably accounts for copper toxicity being greater in young plants than in older ones. Shallower-rooted herbaceous plants were even more sensitive than vines. Liming to alkalinity relieves the condition, but not in all cases completely.

VIDAL (J. P.). **Fasciations et doubles-nœuds sur les sarments des cépages indigènes du Rif sont-ils des symptômes de dégénérescence infectieuse?** [Are fasciations and double nodes on the shoots of the indigenous Vines of the Rif area symptoms of infectious degeneration?]—*Progr. agric. vitic.*, 139, 11–12, pp. 154–159, 6 figs., 1953.

The view having been expressed that the fasciations and double nodes present on native vines in North Africa [*R.A.M.*, 28, p. 437; 31, p. 229] might be specific characters, the author examined in 1949 a number of native vines in two very remote parts of the Rif, Mokrisset, 40 km. north-east of Ouezzane, and Rafsai, 110 km. north of Fez.

In March, 1950, twigs from a native vine displaying these symptoms were grafted on to healthy Rupestris du Lot vines. All the grafts remained affected, and the condition was transmitted to the healthy stocks in every instance after decapitation of the graft, i.e. after ten months' contact. Outward symptoms appeared on six plants out of nine in the same year, and on three others in the second year. Double grafting of healthy Rupestris on a healthy vine carrying an affected graft resulted in visible symptoms of the condition after 12 months' contact.

It is concluded that the fasciations and double nodes present on North African native vines are ordinary symptoms of infectious degeneration [court noué: loc. cit.].

EMILIANI (G.). **Sperimentazione antiperonosporica con preparati organici sintetici e minerali per l'annata 1953.** [Anti-mildew experimentation with synthetic organic and mineral preparations for the year 1953.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 11 (*1953*), pp. 219–241, 1954.

In spraying tests carried out near Rome in 1953 in which 14 organic products were compared for the control of vine mildew [*Plasmopara viticola*: *R.A.M.*, 33, p. 704] S.R. 406 [captan] at about 250 gm. per hl. was possibly superior, and dithane (300 gm.) equal in effectiveness, to 1 per cent. Bordeaux mixture. The duration of efficacy of the two organic products was, however, much shorter than that of Bordeaux. Dithane also displayed a certain irregularity in its effects, not associated with environmental conditions. Dithane was superior to zerlate (fuclasin), and dithane Z78 slightly more effective than parzate. It is concluded that the organic derivatives fulfil the requirements of mildew control fairly well, provided they are applied during the incubation period of the fungus and with sufficient frequency. Vines sprayed up to the end of July only did not, however, retain their foliage as long as those given two further treatments. It is suggested that traces of copper should be added to stimulate growth; in addition, at least one supplementary application should be made, shortly before autumn.

SIBILIA (C.). **L'Oïdium.** [Oidium.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 11 (*1953*), pp. 105–116, 1954.

The author gives a brief, popular account based on the literature, of the biology of vine *Oidium* [*Uncinula necator*: *R.A.M.*, 31, p. 102; 33, pp. 437, 578], conditions

favouring infection, varietal resistance, damage caused, and control. In Italy, considerable resistance is shown by the varieties Cataratto, Crovattina, Freisa, Rossara, Prosecco, Garnanega, Malvasia di Candia, Raboso, Vermentino, Montepulciano, Pericone, Catalanesca, Nerellone, Moradella, and Monica and rather less resistance, depending to some extent on environmental conditions, by Ciliegiolo, Canaialo, Piedirosso, Grignolino, Verdea, and Greco [cf. 17, p. 652]. Sulphur remains the most effective agent of control. Under Italian conditions it is best to use powdered or micronized sulphur for the first application, followed by wettable sulphurs with Bordeaux mixture, the most effective materials being required at the beginning of the vegetative period, subsequent treatments depending on the development of the disease. Usually, three properly timed applications are enough; exceptionally, five to six may be required. The paper concludes with a brief note on dusting and spraying apparatus and on aeroplane dusting.

HEWITT (W. B.). **Some virus and virus-like diseases of Grapevines.**—*Bull. Dep. Agric. Calif.*, 43, 2, pp. 47–64, 2 col. pl., 20 figs., 1954.

During the past few years several virus and virus-like diseases have been found in Californian vineyards. As the local grape industry expanded many varieties and rootstocks were introduced, and some contained diseased vines which were planted along with healthy ones. Some of the diseases have spread naturally, others by propagation. All these diseases are carried in the propagating wood.

The diseases known to be transmitted by grafting or by insect vectors, and to be spreading in California are fanleaf (court-noué) [*R.A.M.*, 29, p. 601], yellow mosaic [33, p. 652], 'white emperor', and that due to lucerne dwarf virus [31, p. 168; 33, p. 577]. Court-noué has spread into many vineyards and new areas. Some varieties and rootstocks in the plots at the Department of Plant Pathology, Davis, do not display symptoms even after inoculation. Leaf symptoms are usually conspicuous in the early season and in cool weather, gradually becoming less distinct as the season advances and in hot weather.

In yellow mosaic the shoots, leaves, stems, and blossom clusters are yellow, the degree of yellowing varying with the season, vine variety, and the strain of the virus. Leaf mottling varies from a slight yellow or cream flecking about the small veins to a pronounced clearing or yellowing along the large veins, and from a slight speckling to a complete yellowing. As the leaves age some yellow areas become greener and others fade to a cream colour that gradually becomes almost white. Most affected vines have the symptoms every year. The disease spreads slowly from vine to vine in an expanding circle.

In 'white emperor', known for some time in vineyards of the Red Emperor variety, the grape does not colour. The disease may be transmitted from white- to red-fruited vines, but does not appear to spread naturally. At maturity the fruit is usually low in sugar [cf. 2, p. 438]. It may vary from pale-greenish or straw-pink to pink. Early in the season the leaves are usually darker and thicker than normal, and are wrinkled along the veins and margins; they curve downwards or roll inwards, and as they age they become reddish-brown and the rolled margins are very prominent. The tissue between the large veins turns pale, as if scorched by the sun, while that adjacent to the veins becomes reddish-brown.

Lucerne dwarf virus has been found in almost every vineyard area of California except the Coachella, Imperial, and Livermore valleys, and it kills many vines every year.

Virus-like diseases include unfruitful vine, enation, asteroid leaf spot, rough bark, leaf roll, and spindle shoot. Wood from unfruitful vines produces new vines similarly affected; sometimes when these vines have been successfully top-worked with good wood, the new tops have become unfruitful. There are different degrees

of unfruitfulness, which vary with the season. The flower clusters generally wither after blossoming. Leaves formed at the bases of canes with the first flush of growth are mottled and speckled with vein-yellowing, these symptoms being most commonly present up to the tenth node.

Leaves with enations [17, p. 221] are mostly present at the bases of the shoots. They may also be distorted and puckered about the veins. Many leaves do not bear enations, but are small, leathery, and thick. Spring growth is often delayed. Some of the internodes are very short at the base and tend to grow downwards. Yields are reduced.

Asteroid-type leaf spot or flecking resembles true mosaic [virus] as described in Europe [cf. 30, p. 304]. The symptoms are a clearing of the very small veins, forming star-like, clear spots.

'Rough bark' occurs in the varieties Palomino and Petite Sirah, which decline in vigour. The bark on the current season's wood cracks longitudinally, the fissures deepening as the canes mature.

In 'leaf roll' the leaves are often rather small, puckered about the margins, and rolled downwards. Yields are greatly diminished. The condition affects the Thompson Seedless, Melon, Sauvignon Vert, Salvador, and French Colombard varieties. 'Spindle shoot' is a form of leaf roll occurring in the two last-named varieties and Tinta Madeira. The shoots as a whole appear spindly, and many side-shoots form along the canes, presenting a brush-like appearance.

KIRKPATRICK (H. C.) & LINDNER (R. C.). **A rapid spectrophotometric assay for some plant viruses.**—*Phytopathology*, 44, 9, pp. 525–529, 1 diag., 2 graphs, 1954.

The virus content of a systemic stone fruit virus in Chicago Pickling cucumber seedlings [*R.A.M.*, 34, p. 280 and next abstract] was assayed at the Tree Fruit Experiment Station, Wenatchee, Washington, by the spectrophotometric method of Lindner *et al.* [31, p. 420] in a modified form, involving the use of $\frac{1}{4}$-in. disks of the cotyledons of each plant as test material and based essentially on the difference in total nucleic acid content of normal and virus infected tissues. The samples were cleared by three ten-minute washings in 70 per cent. alcohol at 80° C. and then hydrolysed at the same temperature for 30 minutes in 3 ml. alcohol and hydrochloric acid (9:1). The hydrolysate was used for spectrophotometric analysis. The virus was found to increase the nucleic acid content of the cotyledons by 25 to 35 per cent.

More than 100 tests can be performed daily by this expeditious procedure, which is also more independent of the growing conditions of the test plants than local-lesion methods of evaluation.

KIRKPATRICK (H. C.) & LINDNER (R. C.). **Studies concerning chemotherapy of two plant viruses.**—*Phytopathology*, 44, 9, pp. 529–533, 1954.

Certain compounds were introduced by vacuum infiltration of the foliage into Chicago Pickling cucumber plants inoculated the day before with the stone fruit virus mentioned above [see preceding abstract] and into Early Wonder tomato seedlings inoculated at the same time with tobacco mosaic virus, applying a vacuum of about 127 mm. of mercury to the former host for three minutes and to the latter for five. Four to 11 days later the virus content was assayed by spectrophotometric and biological methods [loc. cit.]. Measured spectrophotometrically the stone fruit virus content was markedly reduced by chloramphenicol, thiouracil, and guanazolo [*R.A.M.*, 30, p. 447; 34, p. 133], while an even larger decrease was indicated by the local-lesion technique. The spectrophotometric titre of tobacco mosaic virus was lowered by chloramphenicol, thiouracil [33, p. 702], and guanazolo, but not by treatment with malachite green.

LARGE (E. C.). **Thanks to the Colorado Beetle. . . .**—*J. Minist. Agric.*, 59, 10, pp. 463–468, 1953.

The author gives the substance of the first three reports published under the auspices of the European Plant Protection Organization dealing with the control of plant diseases by legislation and quarantine measures; most of the information has already been noticed in this *Review* [*R.A.M.*, 32, pp. 224, 421, 595].

JAUBERT (P.). **Liste annotée des principales affections parasitaires (mycoses, bactérioses, viroses) ainsi que des affections de causes mal définies et des plantes nuisibles aux cultures du Sénégal.** [Annotated list of the principal parasitic disorders (fungus, bacterial, and virus diseases) as well as disorders of doubtful identity and plants harmful to crops in Senegal.]—*Bull. Cent. Rech. agron. Bambey*, 7, pp. 2–39, 3 figs., 1 diag., 1953. [Mimeographed.]

This annotated list contains descriptions of the symptoms and control of the chief diseases of groundnuts [see next abstract], sorghum, little millet [*Panicum miliare*], maize, and cassava in Senegal, French West Africa [cf. *R.A.M.*, 32, p. 90]. It is preceded by a dichotomous key to facilitate identification, the diseases being grouped according to the part of the host affected. There are some literature references, and occasionally brief bibliographies appear in relevant portions of the text.

JAUBERT (P.) & APPERT (J.). **Les problèmes posés par la lutte contre les maladies et les parasites des plantes cultivées au Sénégal.** [Problems presented by the control of diseases and pests of cultivated plants in Senegal.]—*Bull. Cent. Rech. agron. Bambey*, 7, pp. 51–66, 1953. [Mimeographed.]

The authors discuss certain problems to be overcome in controlling plant disease in Senegal, French West Africa [see preceding abstract] and the methods applicable to the colony for use against specific diseases (including fungus, bacterial, physiological, and deficiency disorders), notably leaf spot of groundnuts caused by *Cercospora arachidicola* and *C. personata* [*R.A.M.*, 32, p. 661] for which breeding resistant varieties appears to offer the only means of control.

VANDERWALLE (R.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État pendant l'année 1952.** [Observations and researches carried out at the State Phytopathological Station during the year 1952.]—*Bull. Inst. agron. Gembloux*, 21, 1–2, pp. 160–171, 1953.

In this report on plant diseases in Belgium in 1952 [cf. *R.A.M.*, 30, p. 216] it is stated that beets in the provinces of Antwerp, Liége, and Hainault had 20 to 30 per cent. infection by *Rhizoctonia violacea* [*Helicobasidium purpureum*]. Turnip yellows virus [32, p. 294] was widespread in the province of Antwerp, where 30 to 80 per cent. of the plants were affected; it has now spread to Flanders, where infection ranges from 5 to 55 per cent. It is also present in Brabant, but is more severe in the southern part of the Campine region [to the east of Antwerp]. *H. purpureum* was important on clover and lucerne in the region of Tournai-Ath-Braine-le-Comte; *Sclerotinia ciborioides* [*S. trifoliorum*] caused damage to the same hosts locally in the province of Antwerp and elsewhere; anthracnose (*Pseudopeziza trifolii*) was also present in the Antwerp area. *Pseudomonas tabaci* [*P. tabacum*] was important in some tobacco plantations in the Ardennes, while in the province of Luxemburg it caused a rather marked loss of leaves. Infection by *Sphaerotheca pannosa* was somewhat widespread and severe on roses. Poplar canker [? *Dothichiza populea*] was common in some regions, but appeared to be generally declining.

Sibilia (C.). **Rassegna dei casi fitopatologici più notevoli osservati nel 1952.** [Review of the most noteworthy phytopathological records observed in 1952.] —*Boll. Staz. Pat. veg. Roma*, Ser. 3, 11 (*1953*), pp. 269–293, 1954.

This report from Italy [cf. *R.A.M.*, 32, p. 471] contains, among many others, the following items of information. Vines were appreciably affected by *Uncinula necator* [34, p. 342]. Discoloured vine branches from Bari were affected by excoriosis [34, p. 19], caused by *Guignardia baccae*, which is probably more widespread than has been realized hitherto. 'Esca' disease [*Stereum necator* or *Fomes igniarius*: 29, p. 347] was prevalent at Genoa. Olive trees in various parts of Latium were attacked by *Cycloconium oleaginum* [33, p. 437]. Rust (*Coleosporium senecionis*) [cf. 23, p. 156; 29, p. 366] of *Pinus sylvestris* occurred near Rome. Lemons at Salò were attacked by anthracnose (*Colletotrichum gloeosporioides*) [*Glomerella cingulata*: 33, p. 670]. Chestnut canker (*Endothia parasitica*) [34, p. 113] was found in 17 hitherto unaffected communes in nine Provinces. Both native and foreign potato varieties in almost every part of Italy were very severely infected by *Phytophthora infestans* [30, p. 385; 33, p. 437], though the Solanum variety was highly resistant. Tubers received from Bologna and Aquila were infected by *Fusarium oxysporum* and *F. solani*. Tomatoes from Pescara, Salerno, Scafati, and Rome were affected by *Verticillium albo-atrum* [32, p. 347] and *F. bulbigenum* [var.] *lycopersici* [loc. cit.].

Mladenovski (B.). Нека запажања из области заштите биља у Н. Р. Македонији. [Some observations in the field of plant protection in the P. R. of Macedonia.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1953*, 15, pp. 88–93, 1953. [French summary.]

During a disease survey of Macedonia in October, 1952, special attention was paid to tobacco stations and nurseries. Included among the pests and diseases mentioned on tobacco is powdery mildew (*Erysiphe cichoracearum*) [*R.A.M.*, 32, p. 593], which was very severe and widespread at Kumanovo and Kočane, reducing the yield in the former place by half.

Fruit [unspecified] virus diseases were observed at Kumanovo. On pears, which were 100 per cent. infected, the symptoms were characterized by a greenish-yellow to violet discoloration of the affected leaves, yellowing and thickening of the veins, and slight deformation of the surface. Virus-infected wild apple trees, intended for grafting purposes, differed from healthy ones by being stunted in growth, having a bushy appearance, small and thick leaves, and a violet-coloured mosaic pattern covering the greater part of the leaf surface.

Plantesygdomme i Danmark 1951. Årsoversigt samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1951. Annual survey compiled by the State Phytopathological Experiment Station.]—*Tidsskr. Planteavl*, 57, 1, pp. 1–51, 2 graphs, 1954. [English summary pp. 52–67.]

The following information is contributed to this report [cf. *R.A.M.*, 32, p. 234] by H. R. Hansen, Anna Weber, H. R. Kristensen, and H. A. Jørgensen. Potassium deficiency in barley was widespread, severely weakening the crop during May. Manganese deficiency caused heavy damage to winter cereals and was unusually prevalent and sporadically severe in beet fields during June. Spraying with 1 to 3 per cent. manganese sulphate gave good control.

Helminthosporium [*Pyrenophora*] *avenae* [C.M.I. map No. 105], a rarity in Denmark, was detected in untreated oat seed. Yellow rust (*Puccinia glumarum*) [No. 97] occurred only in experimental plots of French and Belgian wheat varieties. *Ophiobolus graminis* developed in epiphytotic form in almost every wheat-growing district. *Erysiphe graminis* was severe on cereals (especially wheat) and grasses from June until the harvest. *Calonectria graminicola* [*C. nivalis*] was virtually

confined to the extreme north of Jutland, where a heavy snow-cover persisted from the beginning of December until the end of March; rye in particular sustained heavy damage, with crop reductions of 12 to 25 or up to 75 per cent. in April.

The incidence of infection (5 to 10 per cent.) by *Corynebacterium rathayi* in cocksfoot grass [*Dactylus glomerata*: *R.A.M.*, 32, p. 234] was the highest recorded in the country for over 30 years. Virulent outbreaks of *Sclerotinia trifoliorum* occurred on *Lotus corniculatus* and *Anthyllis vulneraria*; the fungus was highly pathogenic in experimental plots of white Ladino clover from the United States.

Cases of strangles were observed among beets, especially in association with black leg (*Pythium*, *Phoma*[*betae*], and other organisms) [cf. 29, pp. 240, 394]. Downy mildew (*Peronospora schachtii*) [C.M.I. map No. 28] was general and often severe in both seed and first-year beets, the latter developing 10 to 36 per cent. infection with a specially high incidence near the seed crops. The symptoms of this disease frequently masked those of beet yellows virus, which was widely distributed and caused extensive infection, ranging from 31 to 100 per cent. in some localities.

As in 1949 and 1950, potato blight (*Phytophthora infestans*) was epiphytotic, an unusual occurrence in three consecutive years. *Corticium solani* killed up to two-thirds of the sprouts emerging from tubers, especially of the Alpha variety, planted deeply in cold soil. Potato wart (*Synchytrium endobioticum*) was reported from six new municipalities.

The storage rots caused by *Gloeosporium album* and *G.* [*Neofabraea*] *perennans* tend to limit the keeping properties of apples, particularly Cox's Orange. Gooseberry mildew (*Sphaerotheca mors-uvae*) presents a serious problem in many districts and has proved refractory to treatment with standard fungicides. *Cronartium ribicola* was a cause of severe injury to gooseberries and black currants, the latter suffering premature defoliation from the combined attacks of the rust and *G. ribis*.

Grey mould of stored onions and shallots (*Botrytis allii*) was much more troublesome in 1951–2 than in the preceding winter. *Penicillium* sp. is another source of damage, but the relative importance of the different fungi requires further investigation. *Phytophthora infestans* destroyed large numbers of outdoor tomatoes; satisfactory protection was conferred by Bordeaux mixture. In several market-gardens, all supplied from the same source, tomatoes were affected by a foot rot tentatively attributed to *P. verrucosa* [cf. *R.A.M.*, 31, p. 256].

The following were observed for the first time in Denmark during 1951. A graft-transmissible virosis characterized by ring-shaped, chlorotic leaf spots, occurred on Nouveau Poiteau pears. The Le Vainqueur peach variety and *Prunus persicoides* displayed conspicuous cream-coloured, often ring-shaped lesions, mostly near the leaf tips or margins, while an oak-leaf pattern was also fairly common. The American line-pattern virus [peach line-pattern virosis virus] is suspected as the agent of this graft-transmissible disease.

Symptoms presenting close analogies with those of the rasp leaf, Pfeffinger, and Eckelrade viruses [34, p. 80] were observed in sweet cherries. The leaves of peach, apricot, and *P. myrobalana* [*P. cerasifera*] showed typical features of asteroid spot [29, p. 33]. Symptoms of currant reversion virus were prominent in red currants [cf. 30, p. 601]. A mosaic of horse-radish, transmissible by sap inoculation to healthy plants of the same host and *Brassica chinensis*, is provisionally ascribed to *Brassica* virus 3 [cauliflower mosaic virus]. *G. fructigenum* [*Glomerella cingulata*] was found on plum, a new host for Denmark.

Eight-year-old privet bushes were infected by *Gnomonia cingulata* [cf. 17, p. 113], causing a brown discoloration and wilt of the current season's shoots, accompanied by sunken lesions on the bark.

Phomopsis dauci was present again on field carrots [cf. 33, p. 519] in early October, 1951.

Annual Report, Department of Agriculture, Northern Rhodesia, for the year 1953.—27 pp., 1954.

In the section of this report [cf. *R.A.M.*, 20, p. 432] dealing with plant pathology (pp. 20–21) it is stated that the crops most worthy of attention from the point of view of disease control in Northern Rhodesia at present appear to be tobacco, rice, and groundnuts. The 205 specimens received by the Department during 1953 have shown the presence of hitherto unrecorded diseases and will be of assistance in the compilation of a list of the plant diseases present in the Territory.

During the 1952 and 1953 seed-bed seasons anthracnose (*Colletotrichum tabacum*) [cf. 28, p. 210] caused severe damage to tobacco seedlings in the Choma-Kalomo area. A disturbing feature of the disease in 1953 was its persistence in the field. Boron deficiency caused bud degeneration of tobacco in the vicinity of Fort Jameson. Maize rust (*Puccinia polysora*) [cf. 33, p. 420: C.M.I. map No. 237] was recorded for the first time locally in 1953. Representatives of the two Rhodesias, Nyasaland, and the Union of South Africa met and decided that as many strains of maize as possible should be planted in each territory where the disease has been recorded, so that resistant lines, if any are found, may be selected and developed.

In trials of summer wheat from Kenya many varieties were severely affected by *Puccinia triticina* [*R.A.M.*, 31, p. 481]; *P. graminis* [33, p. 214] occurred only on a few, and was not serious.

In the Mumbwa Pilot Groundnut Scheme plantings, rosette virus disease and leaf spot (*Cercospora arachidicola*) [cf. 33, p. 334] caused an almost complete failure of the crop. Poor stands appeared to increase the damage due to rosette virus. Die-back of limes was attributed to general malnutrition and to zinc deficiency in particular [cf. 32, p. 473]. No virus infection appeared to be associated with the condition.

Report of the Division of Mycology and Plant Pathology.—*Sci. Rep. agric. Res. Inst. N. Delhi, 1951–1952*, pp. 75–87, 1954.

In the plant pathology section of this report [cf. *R.A.M.*, 33, p. 710] R. S. Vasudeva states that the distribution of physiologic races of the three wheat rusts was much the same as in the preceding year [loc. cit.]; additional races found were *Puccinia graminis* 24, *P. triticina* 107 (confined to Madras and Travancore), and *P. glumarum* D. In the Nilgiris the wild grasses *Vulpia myurus* and *Briza minor* were infected by races 4 and 6 of *P. graminis avenae*. In seedling varietal resistance trials the exotic wheat varieties E. 572, E. 581, E. 871, W. 206-Plant 9, and W. 206-Plant 40 were resistant to each of the nine Indian races of *P. graminis* [34, p. 81] except 42, tested individually, and Pb. C45–56–Plant 1, W. 375–S. 81 (Delhi), W. 375–S.128 (Simla), H. 392–S.51 (Simla), *Agropyron desertorum* (E.C. 1974), and inbred rye (E.C. 1171) to a mixture of the nine races. The varieties E. 928, E. 931, E. 938, and E. 957 were resistant to each one of the eight Indian races of *P. triticina*, and E. 15, E. 304, E. 305, E. 337, E. 352, E. 386, E. 898, E. 930, E. 952, and Af. 31–1 (*Triticum persicum*) to a mixture of these races. Varieties resistant to a mixed inoculum of the ten races of *P. glumarum* included I.C. 834 (*T. dicoccum*), E. 952 (*T. vulgare*), *A. caespitosum*, *A. scabrum*, *A. pauciforme*, *Aegilops ventricosa*, Pb. C. 244, 228, 55–56–Plant 1, W. 375–S.128 (Simla), W. 392–S.51 (Simla), W. 375–S. 81 (Delhi), and several crosses.

Pot experiments and field observations showed that the incidence of wheat foot rot (*Fusarium* sp.) [19, p. 465] is most severe in sandy or manured soils, and at high soil temperature.

Further investigations on wheat tundu disease (*Corynebacterium tritici*) [33, p. 710] showed that the pathogen is carried into the plant by the nematode, *Anguillulina tritici*, almost complete control being obtained by floating off the nematode

galls before planting the seed. Black chaff (*Xanthomonas translucens* var. *undulosa*) was observed for the first time in India in experimental plots containing wheat varieties from the United States.

The analysis of rust-infected barley from different localities in India yielded races 21 and 34 of *P. graminis tritici* [33, p. 710] and 19 and G of *P. glumarum* [loc. cit.]. The efficacy of solar treatment for the control of barley loose smut (*Ustilago nuda*) [loc. cit.] was reconfirmed experimentally by exposure of the seed to a maximum ground temperature of 59° C. following a cold water soak of 2, 3, or 4 hours. No smut appeared in plots sown with treated seed.

During the year 99 sugar-cane varieties were tested for resistance to *Colletotrichum falcatum* [*Glomerella tucumanensis*: loc. cit.; 34, p. 108] by the plug method. Twenty varieties were resistant and 56 moderately so. In field trials less than 5 per cent. infection by *U. scitaminea* [33, p. 711] developed in 19 out of 99 varieties inoculated at Delhi and in nine of 89 at Karnal, compared with up to 100 per cent. in some varieties at both localities. A species of *Pythium*, probably *P. ultimum*, is the cause of seed-rotting of gram (*Cicer arietinum*), a new host record for India. Plants sown in late December were severely wilted towards the end of March by *F. orthoceras* [var. *ciceri*: 32, p. 544].

In varietal trials 98 linseed varieties were found to be immune or resistant in both the seedling and adult stages to a mixture of four Indian races of *Melampsora lini* [33, p. 711]. The pigeon pea varieties N.P. 41. C. 38–3–1, N.P. 69×P. 48–A, and P. 1. remained free from infection by *F. udum* [34, p. 81] in pot and field tests for resistance.

Bacillus subtilis [33, p. 274] was shown to inhibit the growth in culture of *F. udum*, *Rhizoctonia bataticola* [*Macrophomina phaseoli*], *R.* [*Corticium*] *solani*, *Alternaria solani*, *G. tucumanensis*, and to a lesser extent *Botrytis cinerea* [34, p. 239].

In replicated field trials of five seed treatments the highest yield of wheat was obtained with ceresan (58·75 lb.), compared with 44·1 lb. for the untreated.

In an attempt to forecast disease outbreaks by exposing vaseline-coated slides near ground-level uredospores of *Puccinia glumarum* and *P. triticina* were first trapped during 24th to 31st December, 1951, and 7th to 14th December, respectively, the rusts being observed on the wheat crop on 22nd January, 1952. *P. graminis* spores were trapped during the first week in February, the disease appearing on the 23rd [cf. 32, p. 545].

Two hundred isolations of a *Fusarium* from wilted chillies were grouped into seven classes on the basis of cultural characters, those in group 5 being the most virulent.

In a study of the microflora of stored seed *Rhizopus* sp. was common on 12 varieties of sorghum, *Fusarium* sp. on 10 of rice, another *F.* sp. on eight of pea, and *Alternaria* sp. on five of *Cicer arietinum*. After surface sterilization the predominant isolates were the same, but *Mycogone* sp. was as common as *Alternaria* on *C. arietinum*. A seed dressing of 3 in 1000 agrosan GN was effective in preventing pre-emergence injury [to unspecified seedlings].

In the section on plant viruses, it is stated that attempts to infect *Datura* plants systemically with *Cucumis* virus 2 C [cucumber green-mottle mosaic virus: 30, p. 260] were unsuccessful. The virus withstands 75 per cent. alcohol for 48 hours and 82 per cent. for 24 hours. It was transmitted experimentally by the red pumpkin beetle (*Aulacophora* sp.). Further studies on the *Crotalaria juncea* mosaic virus [32, p. 545] showed that the thermal death point was 95° to 98° C., the dilution end point between 1 in 500.000 and 1 in 100.000, and the longevity *in vitro* 257 days at 6° to 10° C. Typical mosaic symptoms were produced on inoculated *C. mucronata* and bean (*Phaseolus vulgaris*); in tobacco the virus was carried without symptoms at low temperatures, producing a faint mottling at higher ones. Local lesions developed on *D. stramonium*, *Nicotiana glutinosa*, and cowpea, while tomato, *Solanum nigrum*, and *S. nodiflorum* were symptomless carriers.

The virus causing leaf curl of *Hibiscus rosa-sinensis* [31, p. 541] was transmitted by grafting to *Abelmoschus moschatus*.

The incidence of [tobacco] leaf curl virus [33, p. 711] in tomatoes was 32·25 per cent. in experimental plots, the average yield of affected plants being 21·1 oz. compared with 34·3 oz. for the healthy. Tomato necrosis [strain of potato virus X], widespread during the period under review, was transmitted by grafting to tomato and *Datura*.

During the testing of symptomless potatoes (variety Darjeeling Red Round) a virus was isolated which produced mosaic symptoms on *N. glutinosa*, necrosis on chilli, and transient mottling on tobacco. The thermal death point lay between 55° and 60° C. and the virus was viable in expressed sap for 15 days at 6° to 10° C.

In the section concerned with systematic mycology it is recorded that a critical study of *Cicinnobolus cesatii* led to the conclusion that *C. major*, *C. sigacollus*, *C. ulicis*, *C. humuli*, and *C. quercinus* should all be considered as synonyms of *C. cesatii*.

Phytopathologie. [Phytopathology.]—*Courr. Cherch., Off. Rech. Sci. Outre-Mer*, 6, pp. 138–156, 1953.

The plant pathology section of this volume summarizing recent published information concerning the work of the French colonial administrations includes contributions from the Office for Overseas Scientific Research covering French West Africa [*R.A.M.*, 33, p. 217], New Caledonia, and France [33, p. 706]; the Overseas Agricultural Services (Ivory Coast [33, p. 757; 34, p. 259]); the Institute for Colonial Fruits and Citrus (French Antilles); and the Research Institute for Oils and Oil Crops (Middle Congo), most of which have been noticed in this *Review*.

Wallace (G. B.). **1952 and 1953 Annual Reports of the Plant Pathologist, Lyamungu, Moshi.**—*Rep. Dep. Agric. Tanganyika, 1952*, pp. 55–60; *1953* (Part II), pp. 71–77, 1954.

In the 1952 report [cf. *R.A.M.*, 32, p. 117] banana Panama disease (*Fusarium oxysporum* f. [var.] *cubense* [32, p. 324] is reported to have spread to the Same (Pare) district. The common variety 'kimalindi' appears to be immune. The bacterial spot of Lima bean [*Phaseolus lunatus*] tentatively attributed to *Pseudomonas syringae* in 1951 is considered by Dr. Dowson to correspond closely to *P. glycinea* [29, p. 133]. *Alternaria brassicae* was isolated from the stems of defoliated candytuft [*Iberis* sp.: cf. 31, p. 224] and found capable of reproducing the disease. An *Aloe* sp. succumbed to foot rot by *Pythium splendens* [cf. 24, p. 150]. Living trees of *Piptadenia buchanani* in the Usambara mountains were infected by *Armillaria mellea* [33, p. 16]. Before replanting an area with susceptible hosts, such as tea, infected trees should be uprooted or ring-barked at least 30 months before felling. *Pinus taeda* is another host of the fungus. Leaf spot of lucerne, found in 1951, has been finally attributed to a strain of *Pseudomonas syringae*. *Nigrospora oryzae* was a minor cause of maize ear rot. Maize rust (*Puccinia polysora*) [34, pp. 83, 348] has been recorded from the Moshi, Kilosa, Muhesa, and Tanga districts and is probably present elsewhere. So far no serious losses have been reported.

Bacterial blight of peas (*Pseudomonas pisi*) [32, p. 114] was found at Iringa early in the year and later at Mbeya. In the Southern Highlands it was observed only in the very early crop. *Fusarium moniliforme* [*Gibberella fujikuroi*] var. *subglutinans* [C.M.I. map No. 191] was responsible for an almost total loss in a plot of Martin sorghum [cf. *R.A.M.*, 30, p. 196] and one of Shallu cross at Ukiriguru; *Macrophomina phaseoli* was also present. Asali disease (*Sphacelia sorghi*) [*Claviceps* sp.: cf. 27, p. 561] was the most destructive sorghum disease in the Eastern Province.

Angular leaf spot (*Pseudomonas angulata*) was the most troublesome tobacco disease at Iringa [31, p. 225]. Wheat yellow rust (*Puccinia glumarum*) [25, p. 154] was severe in the Kenya variety 294 MyC6A in one trial at Iringa. Stem rust (*P. graminis*) [33, p. 214] was also present, particularly in the Dabaga trials. Infection was slight or absent in the varieties 261S10C2D, 291J111, Regent 9756, 337BE2F2, 338AA1A2, and 360H, but was fairly widespread throughout the wheat belt of the Northern Province, though it came too late to cause severe damage. Forms K9 [loc. cit.] and K11 were predominant, K1 and K6 less so.

New records for Tanganyika include *Botryosphaeria ribis* causing apple canker at Lyamungu, *Cordana musae* [C.M.I. map No. 168] and *Curvularia lunata* on banana, *Fusarium solani* associated with bole rot of sisal [32, p. 627], and *Mycosphaerella agapanthi* causing spot and tip withering of the leaves of *Agapanthus umbellatus* [30, p. 195].

In the 1953 report it is stated that the only new site of banana Panama disease was at Pongwe, near Tanga: the destruction of infected plants as they were detected was continued successfully. Provided that the enthusiastic efforts of the agricultural staff in collaboration with the native authorities and growers are continued and extended there should be a considerable increase in banana production. An apparently new *Cephalosporium* sp. was isolated from rotted rhizomes; its significance is not yet known.

Verticillium albo-atrum, isolated from wilting plants of Barberton daisy [*Gerbera jamesonii*: cf. 29, p. 448], was pathogenic to cotton seedlings. Additional symptoms on the daisy were yellow mottling of the leaves and brown discoloration of the root and collar stele due to gum and hyphae in the vessels. Begonia leaves were rotted by *Glomerella cingulata* during the wet season. *Uromyces vignae* was recorded on bonavist beans (*Dolichos lablab*) [cf. 31, p. 476]. Yeast spot (*Nematospora coryli*) was found for the first time on cashew nuts; *Aspergillus niger* [32, p. 626] also occurred on this host.

A collar rot of budded orange and seedling lime, associated with severe drought followed by very wet conditions, was probably caused by *Fusarium solani* [cf. 33, p. 226], which was isolated from the wood and sporulated on the root surface. The stem-pitting strain of the tristeza virus [C.M.I. map No. 289] was present in grapefruit at Morogoro and Lyamungu and, to a lesser extent, in lemon, lime, and orange at Morogoro. Grapefruit at Morogoro appears to carry a mild strain of the virus conferring immunity from the severe strain. Bark disease of coffee, originally described in 1932 [*R.A.M.*, 11, p. 711], appears to be increasing in intensity and extending in range. Widespread in the West Usumbaras and less common on Kilimanjaro, it causes considerable damage and loss of crop. Rust (*Hemileia vastatrix*) [34, p. 34] was so abundant late in the year that it was impossible to assess the relative susceptibility of certain varieties and clones of [*Coffea*] *arabica* at the Coffee Research Station.

Eucalyptus cladocalyx in a nursery at Kisarawe suffered severely after germination and following transplanting from leaf curling and mottling and eventual death induced by *Glomerella cingulata*. The pathogen reproduced typical symptoms in inoculated seedlings. Bordeaux sprays protected fresh sowings. Rust (*Aecidium garckeanum*) was found on several species of *Hibiscus* [31, p. 184]. Lettuce mosaic virus [cf. 22, p. 509] identified on the basis of symptoms only was observed in the Territory for the first time. *Botrytis cinerea* caused a pod rot of Lima bean [*Phaseolus lunatus*]. Maize rust [*P. polysora*; see above] occurred in the three coastal provinces during the year and to a lesser extent at Moshi in the Northern Province. Two mosaic type viruses were observed on papaw [cf. 30, p. 510] as well as root rots caused by *Pythium ultimum* and *P. vexans* [cf. 29, p. 145]. There were no records of bacterial blight (*Pseudomonas pisi*) on peas during the year. Persian lilac (*Melia azadarach*) frequently suffered considerable defoliation by *Septoria meliae*. *Cylindrocarpon*

radicicola was isolated from the roots of a two-year-old tree of *Pinus radiata* at Mufindi. *Cercospora punicae* caused leaf spotting of pomegranate [cf. 21, p. 99]. Of nine imported potato varieties reputedly resistant to blight [*Phytophthora infestans*: 30, p. 510] and three to leaf roll, planted at Kungului farm, Lushoto, 409b (39) (one of the second group) and 1943de(1) were susceptible to blight. Improved drainage and avoidance of overcrowding were recommended to control foot rot of seedling tobacco at Tunduru caused by *Macrophomina phaseoli*. Tomato blight (*P. infestans*) [33, p. 141], which was very prevalent and destructive in the Northern Province, was successfully controlled in a trial by seven applications of perenox [29, p. 389]. Other tomato diseases were fruit rot (*Sphaeronaema lycopersici*) and grey mould (*Botrytis cinerea*). Wheat rusts were not a major problem in 1953 owing to the exceptionally dry weather. Forms K1, K9, and possibly K11 were present. Wheat grains from the Southern Highlands were infected with *Acremoniella verrucosa*.

Hagborg (W. A. F.). **Zymogenic properties of washed cells of bacterial plant pathogens.**—Abs. 19 in *Bact. Proc.*, 1953.

More rapid and reliable determinations of the capacity of plant pathogenic bacteria to break down sugars, alcohols, and glucosides may be made *in vitro* by the utilization of enzymes washed from bacterial cultures, instead of growing the organisms for long incubation periods.

Tešić (Ž. P.). **Osvrt na noviju nomenklaturu kod fitopatogenih bakterija.** [A survey of the recent nomenclature of the phytopathogenic bacteria.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1953*, 18, pp. 68–79, 1953. [French summary.]

In this review of the recent literature on bacterial nomenclature [cf. *R.A.M.*, 31, p. 105] the author states that phytopathogenic bacteria should be placed in the classical genus of *Bacterium*, if asporogenous bacteria are designated by that name.

Pieri (G.). **L'azione di alcuni antibiotici su Agrobacterium tumefaciens e su tumori vegetali.** [The action of some antibiotics on *Agrobacterium tumefaciens* and on plant tumours.]—*Ann. Sper. agr.*, 7, 4, pp. 1059–1066, 2 figs., 1953. [English summary.]

In laboratory tests at the Experimental Station of Viticulture and Oenology, Conegliano, Italy, penicillin at dosages of up to 20,000 units stimulated the growth of *Agrobacterium* [*Bacterium*] *tumefaciens* in Petri dish cultures on an agar medium, though growth became progressively slower at 30,000 to 100,000 units [cf. *R.A.M.*, 34, p. 21]. Streptomycin had a strongly inhibitory effect, only the lowest concentration tested (0·01 gm.) permitting even limited growth.

Ricinus communis plants about 10 cm. high were inoculated with a pure culture of *B. tumefaciens* (controls) and others with cultures previously exposed to the effects of penicillin at 100,000 units or streptomycin at 0·01 to 0·5 gm. One month later the tumours on the controls were of medium size, whereas those on the plants inoculated with the penicillin-treated cultures were larger, the pathogenicity of *B. tumefaciens* having increased. Cultures treated with 0·01 gm. streptomycin caused the formation of small tumours; with higher concentrations of the antibiotic no tumours developed, wound callus forming at the site of inoculation. The morphological variations induced by penicillin in colonies of *B. tumefaciens* remained constant through three successive transfers to untreated media.

Annual Report West African Cacao Research Institute. April, 1952 to March, 1953.—39 pp., 1953.

In the virus section (pp. 7–10) of this report [cf. *R.A.M.*, 33, p. 218] it is stated

that a strain of swollen shoot virus, which although readily transmitted by grafting does not appear to be insect-transmitted, was found at Eddu Suaso. It produces no swellings, and the initial symptoms are often succeeded by symptomless flushes. Preliminary cross-protection tests with Nigerian strains of the virus arranged on a geographical basis have demonstrated some positive and negative relationships.

Both *Cola togoensis* and *Pachira oleagina* showed clear symptoms of swollen shoot virus after infection [cf. 29, p. 608] but no positive back-test was obtained. *Theobroma grandiflorum* and *T.* ? *speciosum* can be infected with several strains of the swollen shoot virus. The presence of natural infection was established in *C. chlamydantha* [loc. cit.] as far east as Foso.

A method of determining whether mealybugs (*Pseudococcus njalensis*) have fed on source plants is being tested, using radio-active phosphorus in the form of orthophosphoric acid. Some individuals which appeared to settle on the source plants did not pick up radio-active phosphorus, indicating, possibly, that they did not feed, but no evidence has been obtained as yet that there are non-transmitting strains of the vector.

In tests conducted to determine how long swollen shoot virus (New Juaben strain) will persist in *P. njalensis* starved under laboratory conditions, transmission was obtained from adults starved for up to 49 hours and from 1st instar nymphs starved up to 24 hours. Two new vectors, H 6756 and H 6817, have been identified as *Pseudococcus* sp. near *gahani* and close to *P. proteae*, respectively. The former is the same species as that reported as a vector by Posnette [30, p. 219].

In the section on mycology (pp. 21–22) it is stated that during a study of the air-borne distribution of the spores of *Phytophthora palmivora* [33, p. 219] no spores so far have been caught in the laboratory (by directing a stream of air over diseased pods towards a Casella Cascade Impactor) or, during the dry season, in the field.

In studies on the saprophytic existence of *P. palmivora* in cacao soil, during the dry season, large green pods buried in sterilized soil previously inoculated with mycelium and spores all became diseased; the fungus was isolated from husk heaps and soil in the field. When, however, pods were buried in different soil types and removed after eight days, *P. palmivora* was not isolated from them in January and February, 1953.

Fifth Meeting of the Inter-American Technical Committee on Cacao, 4th to 10th July, 1954, in Turrialba, Costa Rica.—*Cacao* (*Int.-Amer. Cacao Cent.*), 3, 4, pp. 3–22, 7 figs., 1954.

Abstracts are given of the following papers presented at the Fifth Meeting of the Inter-American Technical Committee [cf. *R.A.M.*, 34, p. 22], organized by the Inter-American Institute of Agricultural Sciences, in co-operation with the Ministry of Agriculture and Industry of Costa Rica.

P. Holliday (p. 10) on the control of black pod rot (*Phytophthora palmivora*) [33, p. 714] and witches' broom (*Marasmius perniciosus*) [34, p. 216] in Trinidad, mentioned that serious losses are caused in areas with over 100 in. rain by the former, but in the drier regions the latter is severe and injures all the beans in affected pods, whereas from pods infected with *P. palmivora* beans can still be prepared. Methods of control are frequent harvesting, spraying with copper fungicides, and breeding resistant varieties. The isolation and culture on oatmeal agar of a fungus were discussed with a view to studying variety or clonal resistance by inoculation trials.

R. G. Orellana reported that surface-disinfected, healthy shell pod pieces placed in contact for a few days with soils inoculated with *P. palmivora* No. 21 became infected up to 101 days later. Surface-disinfected pods inoculated with plantation soil from various depths developed infection after incubation in moist chambers, damage being most severe on pods inoculated with soil from the

shallowest level. Surface-disinfected pods buried at various depths in a cacao shell dump developed *Phytophthora* rot after one to four days of burial, but after the eighth and twelfth days other saprophytes and bacteria appeared, and in some cases no *Phytophthora* was found. Except for the first day of burial, rotting was most severe close to the surface. Surface-disinfected pods suspended over a cacao shell dump at different heights were infected. The control of pod rot by sanitation and fungicides was briefly discussed.

The same author suggested that differences in the dry weight of the fungus grown in liquid media containing cacao shell pod tissue of different U.F. clones indicated corresponding divergences in the character of their pod tissues. It is assumed that degree of resistance and amount of fungus growth are negatively correlated. This method and pod inoculation show promise as techniques for detecting resistance to *P. palmivora*.

R. Desrosiers, C. W. Bolaños, and J. Vargas (p. 11) discussed the evaluation of clones for resistance to witches' broom. The variance of the numbers of brooms produced by clones studied at the Tropical Experiment Station pointed to significant differences between clones in resistance to this disease. The broomage ratio is suggested as a basis for evaluating clones of cacao for resistance when plants are not formally arranged for experiments. Before qualifying as resistant, a clone should have maintained a consistently low broomage ratio for several years under severe conditions.

W. Lellis stated that black pod rot caused losses estimated at approximately U.S. $20,000,000 in Bahia [cf. next abstract], Brazil, and studies at the Uruçuca station have shown that it is most severe during periods of comparatively low temperatures. Removal of diseased pods reduced losses. Cuprosan was the most effective of the sprays tested.

L. R. Siller presented the results of fungicidal spray tests on the control of *P. palmivora*. Bordeaux mixture applied every 30 days increased production by 39·5 per cent., dithane Z-78 by 38·8 per cent., and Bordeaux at 60-day intervals by 14·5 per cent., while SR-406 [captan] had no effect.

The principal fungi observed in cacao pods in the Cameroons, listed with illustrations by J. Grimaldi, comprise *P. palmivora*, *Trachysphaera fructigena*, *Botryodiplodia theobromae*, *Colletotrichum gloeosporioides*, *Macrophoma* sp., *Pestalotia* sp., *Thielaviopsis ethaceticus* [*Ceratocystis paradoxa*], *Fusarium* sp., *Monilia* sp., and *Pterula* sp.

In Colombia the most serious cacao disease is pod rot caused by *Monilia roreri* [*R.A.M.*, 33, p. 593]. C. Garcia (p. 12) reported that so far no fungicide tested has given control, but the tests yielded some [unspecified] information on the biology of the fungus and its effects on fruit-setting.

Dantas (B.). **Estudos experimentais sôbre a 'podridão parda' na região cacaueira da Bahia.** [Experimental studies on 'brown rot' in the Cacao belt of Bahia.]—*Bol. Agric., Pernambuco*, 20, 3–4, pp. 45–66, 1 diag., 1953. [English summary. Received February, 1955.]

This paper is largely concerned with a general scheme for the solution of various technical problems connected with cacao cultivation in Bahia, Brazil, and more specifically with a programme for the control of brown [black] pod rot [*Phytophthora palmivora*: *R.A.M.*, 30, p. 27 and cf. preceding abstract] based on 30 contributions to the literature on the subject. Improved chemical control of the disease necessitates research on new fungicides in place of Bordeaux mixture, new adjuvants, spraying or dusting machinery adapted to the topography of different plantations, and an annual schedule of six applications between the latter half of May and early August, when the virulence of the pathogen reaches a climax. At the time of writing an experiment to compare the relative efficiency of a copper

oxide-wheat flour spray and a copper oxide, flour, and talc dust was in progress at the Jucarí Experiment Station.

The varieties commonly cultivated in Bahia were studied for their reactions to *P. palmivora*, which is generally most severe on the 'parazinho' and 'rough Maranon' types, while the 'common smooth' appears to be relatively resistant even in low-lying situations where the fungus thrives. Various methods of assessing resistance are discussed, including the percentual used by Voelcker in Nigeria [20, p. 155], which the author proposes to adopt for the differentiation between susceptible and resistant individuals in mass selections. Already 27 apparently resistant trees have been selected for breeding operations in the Itabuna district and another five in the Jequitinhonha river area, together with four reputed to be exceptionally productive. A project for more comprehensive research on selection for resistance to black pod rot, estimated to cover 40 per cent. of the Bahia plantations in three years, has also been devised.

Sibilia (C.). **Recenti ricerche sulle ruggine dei cereali.** [Recent researches on the rusts of cereals.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 11 (*1953*), pp. 73–84, 1954.

The author briefly discusses, with 47 references, some of the chief papers published from 1930 to 1951, inclusive, on cereal rusts (*Puccinia* spp.).

Sibilia (C.). **Le razze fisiologiche di Puccinia graminis tritici Erikss. et Henn. in Italia ed in Europa.** [The physiologic races of *Puccinia graminis tritici* Erikss. & Henn. in Italy and in Europe.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 11 (*1953*), pp. 159–164, 1954.

Examination of the records in the literature (18 titles) showed that there are at least 57 races of wheat black rust (*Puccinia graminis*) in Europe [cf. *R.A.M.*, 34, p. 217]. Three are present in Italy [25, p. 551], counting race 17 in Sicily. The most prevalent races, of those on the International List, are race 40 (recorded for 10 of the 11 countries considered in the present paper), 14, 17, and 21, present in six, 24 and 34 in four, 75 and 133 in three, and 15, 133, 143, and 186, each in two.

Basile (Rita). **Razze fisiologiche di Puccinia triticina Erikss. e di Puccinia graminis tritici Erikss. et Henn., su Grani duri e teneri provenienti dall'Algeria.** [Physiologic races of *Puccinia triticina* Erikss. and of *Puccinia graminis tritici* Erikss. & Henn. on hard and soft Wheats coming from Algeria.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 11 (*1953*), pp. 165–168, 1954. [English summary.]

From infected material of the hard wheat Mekki N. 16470 received from Algeria in August, 1953, the author isolated race 11 of *Puccinia triticina* [cf. *R.A.M.*, 34, p. 219]; the soft wheat Mahen from the same source yielded an apparently new race of *P. graminis*, provisionally indicated as Alg. 1. The latter gave a highly characteristic type of infection; Marquis and Reliance were highly resistant; Kota, Vernal, Little Club, and Spelmar intermediate in reaction; and Arnautka, Mindum, Kubanka, Acme, and Einkorn very susceptible.

Lučić (Slobodanka). **Ispitivanja otpornosti nekih linija Pšenice na smeđu i crnu rđu.** [Investigations on the resistance of some Wheat lines to brown and black rust.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1953*, 15, pp. 28–36, 2 pl., 1 graph, 1953. [English summary.]

Wheat brown and black rusts (*Puccinia triticina* and *P. graminis*) [*R.A.M.*, 32, pp. 242, 425] are the two most widespread and most harmful diseases of wheat in Yugoslavia. Since large areas in this country are under wheat cultivation, the resistance of various local varieties and lines of winter wheat to the two pathogens was studied at the Institute of Plant Protection, Beograd, in 1951. In greenhouse experiments lines No. 822 and No. 885/46 and Konkurs [Competition] 25 were

highly resistant to *P. triticina* but not to *P. graminis*. In the field all the varieties tested were attacked by both rusts, although Nos. 822 and 885/46 showed only very slight infection and were classed as resistant. Contrary to the greenhouse results, Konkurs 25 was highly susceptible to *P. triticina* in the field; it was also susceptible to *P. graminis*.

Salazar (J.). **Razas fisiológicas de Puccinia graminis f. sp. tritici Eriks. et Henn. y Puccinia rubigo-vera f. sp. tritici (Eriks.) Carl., en España, en 1953–1954.** [Physiologic races of *Puccinia graminis* f.sp. *tritici* Erikss. & Henn. and *Puccinia rubigo-vera* f.sp. *tritici* (Erikss.) Carl. in Spain in 1953–4.] —*Bol. Inst. Invest. agron., Madr.*, 14, 31, pp. 383–394, 2 maps, 1954. [English summary.]

The physiologic races of *Puccinia graminis* identified on wheat samples collected in different parts of Spain [*R.A.M.*, 34, p. 217] during 1953–4 were 14, 16, 17, 21, 24, 75, and 133, of which the last was recorded for the first time in the country. Race 21 has predominated since 1950. Three races designated A, B, and C closely resemble 17, 34, and 176, respectively, but the first two are distinguished by their pathogenicity to the differential Khapli variety, hitherto resistant to the Spanish races of *P. graminis*, while the last attacks Mindum, which is not infected by 176.

P. triticina [loc. cit.] was represented by races 4, 45, 58, 61, 67, 84, 85, and 86, of which 58, 61, and 85 are new to the country. The very important race 84, occurring in the widely separated provinces of Alicante, Cádiz, La Coruña, and Valencia, is very similar to 4 in its behaviour on the differential varieties, except Democrat, which is susceptible to the former and resistant to the latter. Race A differs from 58 only in its failure to attack Democrat, whereas E is very like 73 except in its pathogenicity to the same variety. Race 67 appears to be extending its range.

Sachs (E.). **Zwergsteinbrandbefall in Abhängigkeit von verschiedenen Kulturbedingungen. (Nach Untersuchungen der Saatenanerkennung 1953 und ergänzender Beobachtungen 1954.)** [Dwarf bunt infection in relation to different cultural conditions. (According to seed certification investigations in 1953 and supplementary observations in 1954.)]—*Z. PflBau*, 5 (49), 4, pp. 146–151, 1954.

This paper and those following from the same journal were presented at a conference of the 'Working Party for Disease Control and Breeding for Resistance in Cereals and Legumes' held at Ingolstadt, Germany, on 22nd September, 1954, each being followed by a discussion. Severe infection by wheat dwarf bunt [*Tilletia controversa*] occurred in Bavaria [*R.A.M.*, 33, p. 530] in 1951, 1952, and 1953. The disease was not always recognized by the field-inspectors, with the result that certification was granted in many cases where it should have been refused. Proceeding on the basis of 3,000,000 spores to a bunt sorus, [F.] Keding devised a scheme of classification into five groups in descending order of severity, without distinction between dwarf bunt and bunt [*T. caries*], in which V is represented by over 120 spores per microscope field (obtained by a special washing procedure), corresponding to more than three sori per 500 gm. seed; IV by 31 to 120 and one to three, respectively; III by 16 to 30 and up to one; II by 1 to 15 and up to $\frac{1}{2}$; and I by 0 and 0.

In 1951, 1952, and 1953 certification was refused on account of bunt to 12·5, 6·6, and 11 per cent. of the seed lots submitted, corresponding to areas of 1,260, 600, and 698 ha., respectively.

The predisposition to dwarf bunt conferred by red clover on the succeeding wheat crop was increased by the application of stable manure to the former. In 1953 early sowing (before 10th October) increased the average amount of infection by *T. controversa* to 99·1 plants per 100 paces as against 58 and 8·6 for medium (10th

to 20th October) and late (after the 20th), respectively. In 1954 the disease occurred exclusively in sheltered positions with a persistent snow-cover.

Warmbrunn (K.). **Ergebnisse diesjähriger Versuche gegen Zwergbrand.** [Results of this year's experiments against dwarf bunt.]—*Z. PflBau*, 5 (49), 4, pp. 152–154, 1954.

In 1954 the resistance of Wahrberger Ruf and other wheat varieties to dwarf bunt [*Tilletia controversa*: see preceding and next abstract] was maintained in Württemberg, Germany [*R.A.M.*, 33, p. 288]. Probably owing to the low incidence of infection (3·75 per cent.) in the experimental fields, 50 kg. brassicol-super per ha. sufficed for soil disinfection. In contrast to the experience of former years, stands from late sowings (after 10th October) were severely attacked.

Wagner (F.). **Die Bekämpfung des Zwergbrandes mit Spritz- und Stäubemitteln.** [The control of dwarf bunt with sprays and dusts.]—*Z. PflBau*, 5 (49), 4, pp. 155–162, 1954.

In further tests in Bavaria on the control of dwarf bunt of wheat [*Tilletia controversa*: *R.A.M.*, 33, p. 224 and cf. preceding and next abstract], soil treatments with brassicol and other [unnamed] preparations reduced spore germination by an average of 98 per cent. when applied up to ten days after sowing. In one experiment in 1952–3, under very humid and cold conditions, brassicol (100 kg. per ha.), applied 28 days after sowing, reduced the incidence of infection in naturally and artificially infected seed to a trace and nil, respectively, while in 1953–4, when abnormally dry and warm weather prevailed, it afforded complete protection at 75 kg. with 31 days' delay. In general, the second week after sowing would appear to be the appropriate time for soil treatment.

The results of several trials failed to demonstrate any advantage in the use of fungicidal calcium cyanamide from the Lonza Works as compared with the ordinary product. Only when applied a month after sowing in amounts of 200 and 300 kg. per ha. did it effect any reduction of dwarf bunt. In any case calcium cyanamide should not be used as the sole means of combating the disease, though it merits further attention as a preferred form of nitrogenous fertilizer on contaminated fields.

Niemann (E.). **Neue Ergebnisse über die Beeinflussung der Keimung von Stein- und Zwergbrand durch chemische und biologische Faktoren.** [New findings on the operation of chemical and biological factors on the germination of bunt and dwarf bunt.]—*Z. PflBau*, 5 (49), 4, pp. 163–168, 4 figs., 1954.

Of 31 chemicals tested for their ability to induce or stimulate the germination of wheat dwarf bunt [*Tilletia controversa*] and rye bunt [*T. secalis*] spores in soil emulsion cultures at 3° to 5° C. in a subdued light, 14 were more or less effective, including potassium permanganate, oxalic acid, ferrous ammonium sulphate, hydrogen peroxide, pyrogallol, and tannin, especially the three first-named, which also exerted a powerful stimulatory action on both species in total darkness. The best results were obtained when the spores were pre-germinated for two to four weeks before being brought into contact with the chemicals. *T. controversa* reacted positively to the stimulants only when the spores were streaked on the media, whereas *T. secalis* germinated well in solutions of the compounds.

The sporadic germination of both species on certain media was shown to be due to the presence of contaminants, two of which were identified as *Alternaria tenuis* and *Stemphylium botryosum* [*Pleospora herbarum*]. A medium of horse dung decoction agar was found to be suitable for the study of this phenomenon, since it supported a reasonably abundant growth of the contaminants and permitted adequate germination of the *T.* spp. On the same medium a strain of *Trichoderma*

viride gave a powerful stimulus to the germination of wheat bunt [*Tilletia caries*] spores when both species began to grow simultaneously, but when the former was given a few days' start the development of the latter was markedly inhibited in proximity to the colony of the contaminant, though near the edge of the dish there was a zone of more luxuriant bunt growth. The development of *T. caries* was further promoted by an unidentified fungal contaminant on sterilized soil emulsion and strongly inhibited by some strains of bacteria, also undetermined, isolated from bunt balls or the soil.

The arrested or delayed germination of *T. controversa* or *T. caries* on a warm sterilized soil emulsion was counteracted by the addition of a few drops of soil extract; with this adjunct, in fact, the spores of the latter species germinated even better than on a normal soil emulsion. On the other hand, *T. secalis* germinated profusely both in light and darkness on sterilized soil emulsion.

It appears certain from these observations that the soil microflora is a critical factor for spore germination and consequently for infection by all three *T.* spp.

Niemann (E.). **Zwergsteinbrand bei Roggen und Gerste nach künstlicher Infektion mit verschiedenen Tilletia-Arten.** [Dwarf bunt of Rye and Barley following artificial infection with various *Tilletia* species.]—*Z. PflBau*, 5 (49), 4, pp. 168–172, 3 figs., 1 graph, 1954.

Following a brief discussion of the origin and systematic position of rye bunt [*Tilletia secalis*] and wheat dwarf bunt [*T. controversa*: see preceding and next abstracts], Gassner's experiences on a visit to Turkey in 1953 are summarized. He found both species exclusively at altitudes above 1,700 m., which is presumably the reason why they have hitherto been overlooked. On his return to Germany, Gassner inoculated some rye and barley plants with bunt spores collected in Turkey from severely dwarfed *Agropyron* and *Hordeum murinum*, respectively, and induced the same symptoms, thereby confirming the supposition of Fischer [*R.A.M.*, 31, p. 378] and Conners [34. p. 29], hitherto based exclusively on spore measurements, that dwarf bunt of wheat and bunt of rye originate on wild grasses. The Turkish spore material resembled that of wheat dwarf bunt and rye bunt in Germany, germinating rather slowly, only at low temperatures, and requiring light or at least developing better under its influence. All the spores were markedly reticulate.

Böning (K.). **Findet eine Infektion durch Zwergbrand auch noch nach Winter statt?** [Does infection by dwarf bunt still take place after the winter?]—*Z. PflBau*, 5 (49), 4, pp. 187–188, 1954.

The results of soil inoculation experiments with wheat dwarf bunt [*Tilletia controversa*: see preceding and next abstracts] in Bavaria in the winter of 1953–4 demonstrated the occurrence at harvest of a trace of infection in plots inoculated as late as 18th March compared with 8·73 per cent. for 19th November. In a soil disinfection test with brassicol, the applications on 13th October and 4th November completely eliminated dwarf bunt, and even those made as late as 25th March and 13th April reduced the number of diseased ears from 53 to a maximum of 9 and 13 per 10 sq. m., respectively. A trace of bunt [*T. caries*] was detected in the plots inoculated on 18th March compared with 16·01 per cent. for 19th November.

Wagner (F.). **Zur Frage der Resistenz der Weizensorten gegen Zwergbrand.** [On the question of the resistance of Wheat varieties to dwarf bunt.]—*Z. PflBau*, 5 (49), 4, pp. 189–190, 1954.

Three wheat varieties, Relief, Wasatch, and Cache, known to be resistant to dwarf bunt [*Tilletia controversa*] in the United States, were tested for their reactions to the pathogen in Bavaria [see preceding abstract] in comparison with Walthari during the winters of 1951–2, 1952–3, and 1953–4. Relief and Wasatch remained

entirely free from the disease throughout the experimental period and the maximum incidence in Cache was 6·4 in 1951–2, when the tests were made under conditions of both natural and artificial infection. Walthari developed 58 per cent. dwarf bunt in naturally infected soil and from 2·7 to 16·4 per cent. in inoculated. Wasatch merits special attention as a parent in breeding operations, since it also contracted only a trace of bunt [*T. caries*: see next abstract] even in naturally infected soil.

Müller (H.). **Ergebnisse von Versuchen über verschiedene Herkünfte von Weizensteinbrand.** [Results of experiments on various sources of Wheat bunt.]—*Z. PflBau*, 5 (49), 4, pp. 173–176, 1954.

The discrepancies in the reaction to seed treatment with various [unnamed] mercurial fungicides of populations of wheat bunt (*Tilletia tritici*) [*T. caries*] from different sources, revealed by recent experiments at the Brunswick branch of the Biological Institute, are considered insufficient to explain the repeated failures of disinfection observed since 1940, especially in south Germany [cf. *R.A.M.*, 34, p. 221 and next abstract]. Environmental factors, particularly soil temperature during germination and emergence of the seed, and soil moisture, appear to be of critical importance, and their combined effects both on seed and spore germination are decisive for the incidence of infection. In general, the approved mercurials are reasonably effective against *T. caries*, but local increases in the prevalence of the disease suggest the advisability of experimental changes in the preparations in current use.

Böning (K.). **Zur Frage der Wirksamkeit der Beizmittel gegen verschiedene Herkünfte des Weizensteinbrands.** [On the question of the efficiency of fungicides against different sources of Wheat bunt.]—*Z. PflBau*, 5 (49), 4, pp. 177–186, 1954.

The results of recent experiments in Bavaria indicate that collections of wheat bunt [*Tilletia caries*] from different sources vary in their sensitivity to mercurial fungicides, but such discrepancies would hardly explain the failure of seed treatment sometimes observed in practice [see preceding abstract]. In future, however, several collections or mixed populations, preferably such as have already proved resistant to routine treatment, should be used in the assay of fungicides. An increase in the normal dosage of spore inoculum (0·2 gm. per kg. seed), e.g., to upwards of 2 gm., is also recommended. The objection that the seed cannot accommodate such quantities is refuted by the fact that nine samples from various localities contained 3·8 to 28·1 gm. per kg.

Discussing the question whether the standards for the approval of seed disinfectants are too exacting, the writer points out that even the most effective dressings permit the development in a 3-sq. m. replication plot of at least one diseased ear, which considerably exceeds the limit for certification of one per 80 paces on either hand. In this connexion it is emphasized that after the years of neglect during and following the war, the degree of elimination requisite for certification can only be achieved by a return to the former practice of regular annual treatments.

The results of preliminary experiments with 18 wheat varieties lend no support to the view that variations in reaction of different populations of *T. caries* to mercurials are correlated with the development of physiologic races, producing different symptoms according to the variety attacked.

Pilgrim (A. J.) & Waldee (E. L.). **Effect of post emergence fungicidal applications to Wheat plants for control of dwarf bunt.**—*Plant Dis. Reptr*, 38, 11, pp. 750–752, 1954. [Multilithed.]

In experiments carried out at Nephi, Utah, in 1947–8 for the control of dwarf

bunt (*T. brevifaciens*) [*T. controversa*: *R.A.M.*, 33, p. 716; 34, p. 220] on Utah Kanred wheat, seed treatment with semesan (1 oz. per bush.) failed to reduce infection. Incidence was lower in plants sprayed with 4–4–50 Bordeaux mixture or dusted with ceresan (one part) and lime in November, six weeks after emergence (0·47 and 0·15 per cent., respectively), or treated in November and again in January (1·2 and 0·2 per cent., respectively, for the two fungicides), than in the untreated controls (5·25), but the later application alone was not effective.

Leukel (R. W.). **Seed-treatment tests on winter and spring Wheat and Oats for smut control 1953–54.**—*Plant Dis. Reptr*, 38, 11, pp. 755–759, 1954. [Multilithed.]

Seed treatment trials for the control of bunt (*Tilletia* sp.) on Purplestraw winter wheat and loose smut (*Ustilago avenae*) on Fultex winter oats [*R.A.M.*, 33, p. 527 and next abstract] were carried out in 1953–4 by the Plant Industry Station, Beltsville, Maryland. Of the 22 treatments tested, ceresan M slurry ($\frac{1}{2}$ oz. per bush.), Du Pont 244 ($\frac{3}{4}$) and 364 ($\frac{1}{2}$), both liquids, mycon slurry (1), and panogen liquid ($\frac{3}{4}$) eliminated bunt in outdoor beds and in the field, where the untreated controls developed 92·5 and 76·3 per cent. infection, respectively. Control of *U. avenae* was less satisfactory, only panogen eliminating infection in both series (untreated 54·2 and 20·5 per cent.), while ceresan M, ceresan M2X slurry ($\frac{1}{4}$), Du Pont 244, and pura C–13–1212 slurry ($\frac{1}{2}$) reduced it to less than 5 per cent.

In co-operative experiments at six stations using Red Bobs wheat and Canadian oats, both spring varieties, all the materials eliminated bunt at Beltsville, Blacksburg, Virginia, St. Paul, Minnesota, and Madison, Wisconsin. At Pullman, Washington, with the highest incidence of infection (80 per cent.) in the untreated, none of the fungicides allowed more than 3 per cent. infection and panogen 15 ($\frac{3}{4}$), panogen 42 ($\frac{1}{4}$), Du Pont 244 and 364, MEMA liquid ($\frac{1}{2}$), pura C–13–1212, and pura C–14–66 slurry ($\frac{1}{2}$) gave complete control. On oats, panogen 15, panogen 42, Du Pont 244, MEMA ($\frac{1}{4}$), BB–350–37 ($\frac{1}{2}$ and $\frac{3}{4}$), all liquids, and ceresan M, ceresan M2X, and puraseed ($\frac{1}{2}$), all slurries, reduced the average incidence of loose smut and covered smut (*U. kolleri*) to less than 0·6 per cent.

Holton (C. S.) & Purdy (L. H.). **Control of soil-borne common bunt of winter Wheat in the Pacific Northwest by seed treatment.**—*Plant Dis. Reptr*, 38, 11, pp. 753–754, 1954. [Multilithed.]

In the 1953 experiments at Pullman and Moro, in the Pacific Northwest, treatment of wheat seed with anticarie at all concentrations tested ($\frac{1}{2}$ to 8 oz. per bush.) gave complete control of soil-borne infection by bunt (*Tilletia caries* and *T. foetida*) [see preceding abstract]. Pentachloronitrobenzene (20 and 75 per cent.) was highly effective at 2 oz. or more. These results were generally confirmed by the 1954 tests in the same localities and at Pendleton. Anticarie, however, did not give adequate control at $\frac{1}{2}$ oz. and 75 per cent. pentachloronitrobenzene, though effective at 2 oz. or more, was comparable with anticarie only at the impractical rate of 4 oz. Tetrachloronitrobenzene (50 per cent.), though inadequate at all rates, showed some promise at 2 and 4 oz. and should be tested further in formulations with higher percentages of the active ingredient.

Koehler (B.) & Bever (W. M.). **Oat and Wheat seed treatments: methods, injuries, and gains.**—*Plant Dis. Reptr*, 38, 11, pp. 762–768, 1 graph, 1954. [Multilithed.]

In experiments on the seed treatment of wheat and oats carried out [against unspecified diseases] by the Illinois Agricultural Experiment Station and the Field Crops Research Branch, Agricultural Research Service, United States Department

of Agriculture, germination tests indicated that when seed treated with ceresan M slurry ($\frac{1}{4}$, $\frac{1}{2}$, and 1 oz. per bush.) was stored for three days in sealed 1-pint Mason jars which were then opened for the rest of the storage period (150 days in all) the closest approximation to commercial storage conditions was obtained. This would be a useful experimental method except when the influence of the storage period is involved.

Increases in dosage of volatile mercury compounds, in the time from treatment to germination, and in grain moisture (from 13·9 to 16·7 per cent.) resulted in increased damage to germination. The greater injury caused by ceresan M ($\frac{1}{2}$ oz.) than by panogen ($\frac{3}{4}$) could not be attributed to differences in volatility [cf. *R.A.M.*, 34, p. 223], the active ingredient in panogen being the more volatile. For the treatment of lightly infected or nearly disease-free seed, followed by storage for two weeks or more, ceresan M at half the standard rate or panogen at the standard rate are recommended as giving maximum yields.

Treggi (G. C.). **Qualche prova con un nuovo preparato anti-carie.** [Some tests with a new anti-bunt compound.]—*Agricoltura ital.*, 53 (N.S. 8), pp. 21–26, 3 figs., 1953. [Received 1954.]

Laboratory and field experiments, using agrosan GN for comparison, demonstrated that the effectiveness of mercurigamma [mergamma: *R.A.M.*, 32, p. 308] in controlling wheat bunt [*Tilletia caries* and *T. foetida*] in Italy was comparable with that of the more common mercurials. It displayed no toxicity to the caryopses; on the contrary it exerted a slightly stimulating effect.

Efimova (Mme N. S.). Яровизация семян озимой Пшеницы и поражаемость её твердой головней [Vernalization of winter Wheat seeds and their infection with bunt.]—Агробиология [*Agrobiology, Moscow*], *1954*, 5, pp. 135–136, 1954.

In experiments at the Botanical Garden of Kazakh State University, U.S.S.R., winter wheat seed (varieties *erythrospermum* 15 and *ferrugenum* 29) was soaked in water, infected with a spore suspension of *Tilletia levis* [*T. foetida*: *R.A.M.*, 33, p. 717], and vernalized in a refrigerator (temperature ranging from 0° to 3° C.) for 57 days in 1948; part was further vernalized for 46 days and the remainder for 57 days in 1949. It was again infected with bunt before sowing but none of the plants developed the disease symptoms under conditions favourable to bunt development.

Batts (C. C. V.). **Infection of Wheat by loose smut, Ustilago tritici (Pers). Rostr.**—*Nature, Lond.*, 175, 4454, pp. 467–468, 2 figs., 1955.

An anatomical investigation of loose smut (*Ustilago tritici*) in the ears of the susceptible wheat varieties Hybrid 46 and Vilmorin 27 inoculated at anthesis by the partial vacuum method [*R.A.M.*, 33, p. 220] was made at the National Institute of Agricultural Botany, Cambridge, during 1953 and 1954. No evidence of infection down the style was found. The fungus entered the ovary wall through any part of the pericarp [25, p. 159], an appressorium and the usual peg-like structure forming at the point of entry. After about ten days the mycelium had reached the testa and began to invade it, chiefly intracellularly. The hyphae extended to the depth of only a few cells in the endosperm, but over the embryo, on the dorsal side of the grain, they grew through the aleurone layer and, after about 30 days, into the scutellum. Neither the plumule nor radicle was penetrated. An examination of several grains selected at random from ears in a badly infected crop of Hybrid 46 on a Sussex farm in July, 1954, revealed that spores were frequently present on the wall of the developing grain, and mycelium and penetration points were present on the pericarp of each grain having an infected embryo and testa.

Pugsley (A. T.). **The resistance of White Federation 45 and Dundee 48 Wheat to Ustilago tritici (loose smut of Wheat.).**—*J. Aust. Inst. agric. Sci.*, 19, 4, pp. 238–240, 1953. [Received 1954.]

At the Waite Agricultural Research Institute, Adelaide, the resistance to a race of *Ustilago tritici* [*R.A.M.*, 22, p. 473] was shown to depend on a single dominant gene in the wheat varieties White Federation 45 and Dundee 48 when crosses were made with the susceptible Ranee.

Shaw (Dorothy E.). **The genus Selenophoma on Gramineae in Australia.**—*Proc. Linn. Soc. N.S.W.*, 78, 3–4, pp. 151–159, 1 pl., 1953. [Received March, 1955.]

Selenophoma donacis, not previously recorded in Queensland or New South Wales, was detected there on *Arundo donax* in 1950 and 1952. *S. donacis* var. *stomaticola* is recorded on wheat [cf. *R.A.M.*, 32, p. 474] in South Australia and for the first time on wild and introduced grasses in New South Wales, the Northern and Capital Territories, Tasmania, and South Australia. Isolates from the various hosts were host specific, so it is probable that the disease will be serious only on particular species in certain localities. In tests of the popular and breeding varieties of wheat *Triticum monococcum* and its var. *flavescens* were resistant, *T. timococcum*, Democrat, Exchange, Hofed, M.D. 1303, and Mentana moderately so, while the remaining varieties showed various degrees of susceptibility.

White (N. H.) & Baker (E. P.). **Host pathogen relations in powdery mildew of Barley. 1. Histology of tissue reactions.**—*Phytopathology*, 44, 11, pp. 657–662, 2 figs., 1954.

At the Faculty of Agriculture, University of Sydney, New South Wales, histological observations were made on barley, oats, rye, and wheat leaves inoculated with a race of *Erysiphe graminis* resembling Cherewick's No. 3 [*R.A.M.*, 23, p. 291] and stained in hot lactophenol-cotton blue solution. Conidial germination and appressorial formation were the same on all hosts, but on oats, rye, and wheat either no penetration took place or further development of the fungus was arrested at the papilla stage [14, p. 711]. An exception was the wheat variety Federation, which reacted similarly to the highly resistant barleys, B 56, *Hordeum spontaneum*, and B 278, Triple bearded lemma C.I. 6766. Mycelial development was very restricted and sparse, one conidial branch being occasionally formed by a colony. The epidermal cells of each infection court contained at the most two haustoria, usually only one. Beneath each infection court the mesophyll cells had collapsed, as also had at least one epidermal cell at many points of invasion. In the resistant B 155, Portuguese, B 165, Portuguese, and B 167, Goldfoil, the epidermal cells contained 5 to 12 haustoria, the corresponding numbers in the semi-resistant B 28, Purple nudum C.I. 2250, and B 69, No. 22, and the susceptible B 49, Kinver, being 10 to 15 and 20 to 30, respectively.

It appears from these results that mycelial development is related to the number of haustoria formed, which in turn seems to be limited by mesophyll collapse. It is argued, therefore, that resistance to powdery mildew in barley is a function of the rapidity and extent of mesophyll collapse rather than a sequel to the death of epidermal cells or arrested haustorial development.

Simons (M. D.). **Physiologic specialization and inheritance of resistance to specific races of Puccinia coronata Corda var. avenae F. & L.**—*Iowa St. Coll. J. Sci.*, 27, 2, pp. 253–254, 1953.

As the result of a study of the relative efficiency of 18 differential oat varieties grouped into (*a*) the standard 13 differential varieties, (*b*) a new set containing Anthony, Victoria, Appler, and Bond of the old set plus Landhafer, Santa Fe,

Ukraine, Trispernia, and Bondvic, and (*c*) the combined set of 18, in identifying collections of crown rust (*Puccinia coronata* var. [f. sp.] *avenae*) [*R.A.M.*, 32, p. 674] present in Iowa in 1950, the author gave preference to the new set plus Saia which was added to both new and combined sets in 1951.

The mode of inheritance of reaction to races 1, 45, and 101 was studied in several oat crosses. In every case the resistance of Landhafer was apparently governed by a single gene [30, p. 103] although the degree of dominance varied considerably. Assuming that Early Santa Fe and Santa Fe-Clinton carried two genes for resistance linked with a recombination value of approximately 23 per cent., resistance to races 45 and 101 in three crosses appeared to be inherited in the same manner. The resistance of Trispernia to races 1 and 101 appeared to be governed by a single gene and, as with Landhafer, the degree of dominance varied in the different crosses. Landhafer × Trispernia and × Santa Fe-Clinton exhibited transgressive segregation for resistance to race 101, certain F_2 plants being more resistant than either parent.

Earhart (R. W.). **Effect of certain seed treatments on stand, yield and seedling blight in Sunland Oats.**—*Plant Dis. Reptr*, 38, 11, pp. 760–761, 1954. [Multilithed.]

In greenhouse experiments at Gainesville, Florida, in 1953–4, the effects were compared of 12 different seed treatments on emergence and control of *Helminthosporium* seedling blight (*H.* [*Pyrenophora*] *avenae* and *H. sativum*) in Sunland oats [*R.A.M.*, 33, p. 476]. When the seed was stored for ten weeks after treatment all the fungicides increased emergence, and pentrete liquid (Pennsylvania Salt Mfg. Co., ¾ oz. per bush.), MEMA liquid (¾), ceresan M dust (½), BB/LML/20 liquid (Chipman Chemical Co., ¾), and panogen liquid (¾) gave the most effective control of seedling blight, with 3, 3, 3, 5, and 8 per cent. infection, respectively, as against 92 per cent. for the untreated.

Grasso (V.). **Attachi di Ustilago hordei (Pers.) Lagerh. sui culmi dell'Orzo.** [Attacks of *Ustilago hordei* (Pers.) Lagerh. on the culms of Barley.]—*Ann. Sper. agr.*, 7, 4, pp. 1087–1093, 3 pl., 1953. [English summary.]

At the Institute of Forest and Agricultural Pathology, University of Florence, Italy, a variety of barley inoculated with *Ustilago hordei* developed infection on the culms. At maturity only a few spikes emerged from the sheath, the smut having spread from the floral parts as far as the last node, either infecting almost the whole surface of the culm or occurring as slightly raised stripes separated by healthy tissue. In some cases the node was swollen or bore conspicuous malformations. On infected barley from Cagliari smut masses were generally present as a uniform subepidermal layer. In both lots of material the vascular bundles were unaffected. Further work is in progress.

Pendleton (J. W.), Dungan (G. H.), Koehler (B.), Bigger (J. H.), Lang (A. L.), & Johnson (P. E.). **1952 Illinois Corn tests.**—*Bull. Ill. agric. Exp. Sta.* 564, 32 pp., 2 figs., 1 map, 1953.

The results of the 1952 maize experiments at the Illinois Agricultural Experiment Station, Urbana, have shown that the common seed treatments against seedling blights increased yields during the past three years by 7·6, 10·2, and 8·6 per cent., respectively. In cold chamber (50° F.) and field tests in cold soil arasan was always better than spergon, but in warm soil they produced similar results. Stewart's disease [*Xanthomonas stewarti*: *R.A.M.*, 32, p. 676] caused 50 per cent. loss of leaf area in early September in some fields in St. Clair and Effingham counties. Northern leaf blight [*Helminthosporium turcicum*: 32, p. 619] was slight throughout the State

but became more serious towards the end of the season in some localized areas. Damage from stalk rots, *Diplodia zeae* and *Gibberella zeae* [32, p. 182] in particular, was less than in previous years, *D. zeae* causing twice as much premature dying of plants as *G. zeae*. A stalk rot, due to bacteria or *Pythium* sp., and charcoal rot (*Sclerotium bataticola*) [*Macrophomina phaseoli*: 30, p. 24], both limited to hot seasons, were more common than usual. Ear rot damage due to *Fusarium moniliforme* [*Gibberella fujikuroi*: 32, p. 182], *D. zeae*, *G. zeae*, and various moulds was low.

Taylor (G. S.). **Stalk rot development in Corn following the European Corn borer.**—*Iowa St. Coll. J. Sci.*, 27, 2, pp. 265–266, 1953.

[Unspecified] bacteria, *Fusarium moniliforme* [*Gibberella fujikuroi*], and *Cephalosporium acremonium* were isolated most frequently from rotted maize stalks invaded by the European corn borer [*Pyrausta nubilalis*: *R.A.M.*, 32, p. 479]; *G. zeae*, *Diplodia zeae*, *Mucor* sp., *Rhizopus* sp., and *Nigrospora oryzae* were less prevalent. When certain of these organisms were introduced into the internodes of Iowa hybrid 4316 in the field during 1950 about two weeks after pollination by the toothpick and hypodermic needle methods the most rot was caused by *C. acremonium* and *C.* sp.; *G. zeae* and *Rhizopus* sp. were the most common in inbred M14. Higher percentages of the internodal areas were rotted in the inbred line than in the hybrid. In a comparable trial in 1951 using inbred line L 289 and Iowa hybrid 4316 the most rot developed from *D. zeae* and *C. acremonium*, and an intermediate amount from *G. fujikuroi*, *G. zeae*, and a yeast.

The inheritance of resistance to *D. zeae* proved complex although first generation hybrids between moderately resistant and susceptible inbreds carried resistance approaching that of the resistant parent, while second generation hybrids and backcrosses carried resistance intermediate between two such parents.

Wallace (G. B.) & Wallace (Maud M.). **Diseases of Sorghum.**—*Pamphl. Dep. Agric. Tanganyika* 53, 16 pp., 3 pl., 1953.

The diseases of sorghum found in Tanganyika Territory are briefly described and illustrated under the headings of leaf spots, ear diseases, smut diseases, and control measures. Among fungi causing leaf spots are included *Puccinia purpurea* [C.M.I. map No. 212], *Helminthosporium turcicum* [No. 257], *Ramulispora sorghi*, *Ascochyta sorghina* [cf. *R.A.M.*, 32, p. 90], *Cercospora sorghi* [cf. 32, p. 670], *Colletotrichum graminicola* [cf. 22, p. 90], *Gloeocercospora sorghi* [24, p. 443], *Sclerospora sorghi* [C.M.I. map No. 179], and *Phyllosticta sorghina*. A key based on macroscopic characters is given to aid in the identification of these leaf diseases in the field. Grain diseases described are ergot (*Sphacelia sorghi*), *Phyllosticta* seed disease (*P. sorghina*), and four smuts, namely, *Sphacelotheca sorghi* [No. 220], *S. cruenta* [cf. *R.A.M.*, 31, p. 33], *S. reiliana* [31, p. 320], and *Tolyposporium ehrenbergii* [loc. cit.]. The authors estimate the losses due to sorghum diseases in the Territory to be at least five per cent. of the total yield.

In an appendix two new records for the Territory are noted, foot rots of sorghum caused by *Fusarium moniliforme* [*Gibberella fujikuroi*] var. *subglutinans* and *Macrophomina phaseoli*.

Leukel (R. W.), Webster (O. J.), & Porter (R. H.). **Sorghum seed-treatment tests in 1954.**—*Plant Dis. Reptr*, 38, 11, pp. 769–770, 1954. [Multilithed.]

In field trials at Beltsville, Maryland, Lincoln, Nebraska, and Fort Collins, Colorado, of 16 seed treatments for the control of sorghum kernel smut (*Sphacelotheca sorghi*) [*R.A.M.*, 34, p. 24], using inoculated seed, panogen (¾ oz. per bush.), Du Pont 364 (½), setrete (½), and merculine (½), all liquids, and mergamma (3), agrox (½), puraseed (½), pura C–14–66 (1½), orthocide (2), spergon (2), phygon (2),

and copper carbonate (2), all slurries, eliminated the disease on Sharon Kafir at all three stations. Control on Rancher sorgo was, on the whole, unsatisfactory, phygon alone resulting in no infection at Beltsville and Fort Collins.

Gorter (G. J. M. A.). **Kernel smut of Kaffircorn.**—*Fmg in S. Afr.*, 29, 343, pp. 494, 502, 2 figs., 1954.

Kernel smut of kaffircorn [*Sorghum caffrorum*] caused by *Sphacelotheca sorghi* causes considerable damage throughout the provinces of the Union and South-West Africa [*R.A.M.*, 33, p. 657]. Experiments at Potchefstroom during the past two years have demonstrated that the local Radar grain sorghum is the most susceptible variety, Birdproof and Red-Mix fairly so, Martin and Jordaan White fairly resistant, and Hegare immune. Sudan grass and the American varieties dwarf Yellow Milo (C.I. 332), Pierce Kaferita (K.B. 2547), and a Kafir × Kaferita Cross (H.C. 2423) were all immune [cf. 32, pp. 176, 676]. Atlas cane sorghum was heavily attacked. Control is achieved by seed treatment with most proprietary dusts [33, p. 657] at 4 oz. per 100 lb. seed; finely ground flowers of sulphur, though effective, gives no protection against other diseases.

Todorova (Vyara). Опити за обеззаразяване на Просо и Мохар срещу главани. [Seed disinfection experiments against smut on Millet and Italian Millet.]—*Rev. Inst. Rech. sci. Minist. Agric., Sofia*, 1, pp. 159–168, 1953. [Russian and English summaries.]

Ustilago panici-miliacei [*Sphacelotheca destruens*] and *U. crameri* are the two most important diseases of millet (*Panicum miliaceum*) [cf. *R.A.M.*, 17, p. 434] and Italian millet (*Setaria italica*) [C.M.I. map No. 239], respectively, in Bulgaria. Control measures, recommended by the Institute of Plant Protection, Sofia, include the immersion of seed in formaldehyde solution (1 in 300) for 10 to 15 minutes or partly dry treatment of seed with the same disinfectant (1 in 100) at the rate of 4 l. per 100 kg. of seed.

Wallihan (E. F.). **Relation of chlorosis to concentration of iron in Citrus leaves.**—*Amer. J. Bot.*, 42, 2, pp. 101–104, 1 fig., 1 graph, 1955.

Chemical analyses of soap-washed leaves collected over two years from iron-chlorotic orange, lemon, and grapefruit trees in southern California [*R.A.M.*, 33, p. 152] led to the following conclusions: (1) iron chlorosis [33, p. 479; 34, p. 33] is caused by a simple iron deficiency; (2) the critical concentration in normal leaves is about 80 p.p.m. of dry matter; (3) the pattern of chlorosis gives only an approximate indication of the degree of deficiency, in advanced stages; (4) future research should be directed towards ways of supplying iron to the leaves.

Calavan (E. C.) & Wallace (J. M.). **Hendersonula toruloidea Nattrass on Citrus in California.**—*Phytopathology*, 44, 11, pp. 635–639, 1 fig., 1 graph, 1954.

Hendersonula toruloidea [*R.A.M.*, 14, p. 83] was found at the University of California Citrus Experiment Station, Riverside, to enter grapefruit trees through wounds, causing die-back and canker. The toruloid form of the fungus, *Exosporina fawcetti*, which may be identical with *Torula dimidiata* [28, p. 495], is prevalent on citrus in the Salton Basin and elsewhere, while the pycnidial state has been collected on lemon bark. Pycnidiospores from lemon bark and potato dextrose agar cultures measured on an average 12·4 by 4·9 μ. Growth occurs through a temperature range from 18° to 39° [C.], with an optimum at 33°. *H. toruloidea* is frequently but not invariably associated with lesions of the Rio Grande gummosis type [31, p. 237]; the internal symptoms of the two diseases, however, are distinct. Control measures against *H. toruloidea* are not normally required.

DAVISON (J. R.). **Trifoliata—comments on its behaviour and handling as a Citrus root stock on the Murrumbidgee irrigation area.**—*Agric. Gaz. N.S.W.*, 64, 7, pp. 358–361, 8 figs., 1953.

Much of this information on the use of *Poncirus trifoliata* as a citrus rootstock in New South Wales because of its resistance to *Phytophthora citrophthora* has already been noticed [*R.A.M.*, 34, p. 33].

BRUN (J.). **Dégats causés par Oospora citri aurantii (Ferr.) Sacc. sur les Bergamotes.** [Damage caused by *Oospora citri-aurantii* (Ferr.) Sacc. on Bergamots.]—*Fruits d'outre mer*, 8, 3, pp. 120–121, 1 fig., 1953.

In August, 1952, Bergamot oranges growing at the Institute for Colonial Fruits and Citrus, Foulaya, [French] Guinea, fell prematurely following infection by *Oospora citri-aurantii* [*R.A.M.*, 32, p. 304], which produced successively brown-, bronze-, and buff-coloured lesions, surrounded by a darker margin. Usually a storage rot it probably entered unripe fruit by way of punctures caused by *Othreis fullonia* [loc. cit.], a butterfly which has been recorded at Foulaya. Few of the Bergamot trees retained their fruit until maturity, 15 to 20 per cent. of the punctured fruit falling as a result of the rot. Several pomelos and sweet and acid limes, however, appeared to be unaffected.

DI CARO (S.). **Marciume dei rami degli Agrumi da Sclerotinia sclerotiorum (Lib.) De By.** [Branch rot of Citrus caused by *Sclerotinia sclerotiorum* (Lib.) de By.] —*Ann. Sper. agr.*, N.S., 7, 2, pp. 395–399, 2 figs., 1953. [English summary.]

A brief account is given of branch infection by *Sclerotinia sclerotiorum* [*R.A.M.*, 12, p. 758; cf. 24, p. 500] on one orange and one lemon tree growing in a damp situation in the province of Catania, Sicily.

DARLEY (E. F.) & WILBUR (W. D.). **Some relationships of carbon disulfide and Trichoderma viride in the control of Armillaria mellea.**—Abs. in *Phytopathology*, 44, 9, p. 485, 1954.

It was demonstrated by previous laboratory studies that sublethal doses of carbon disulphide, while not directly killing *Armillaria mellea* in [citrus] roots, initiated biological control by stimulating *Trichoderma viride* to invade and destroy the pathogen after 30 days. Following field fumigation [in California: *R.A.M.*, 30, p. 608] with 2 oz. of the compound per 2·25 sq. ft., isolations from infected roots buried at 3 ft. yielded *A. mellea* for the first two to three days, were sterile for the next four to six, indicating direct kill, gave bacteria non-pathogenic to the fungus up to 30 to 50 days, and *T. viride* regularly thereafter. When the dosage was reduced to ½ oz. there seemed to be no direct kill. *A. mellea* was isolated up to 26 days and *T. viride* after 30. The antagonist did not develop in soil from which *Armillaria*-infested roots were absent, in the field when roots were buried 18 days after fumigation, or in jars filled with soil fumigated and aerated before the introduction of roots. Once *T. viride* was stimulated in fumigated soil containing infected roots, its lethal activity persisted for at least three months.

COHEN (M.) & KNORR (L. C.). **Honeycombing—a macroscopic symptom of tristeza in Florida.**—Abs. in *Phytopathology*, 44, 9, p. 485, 1954.

Over 90 per cent. of the citrus trees hitherto observed to be affected by tristeza in Florida [*R.A.M.*, 34, p. 91], whether the top is sweet orange, lemon, or grapefruit, have shown a pattern of minute holes called 'honeycombing' on the inner surface of the bark of the sour orange rootstock, just below the bud union. In typical cases of 'honeycombing' bark sections from the bud union have invariably been rated positive by the Schneider test for tristeza [33, p. 671], but various other

conditions simulating this feature of the disease have also been detected in the bark of sweet orange, rough and sweet lemons, Tahiti lime, and other species of citrus. They may be differentiated from typical tristeza 'honeycombing' by the absence of other histological symptoms and failure to transmit vein-clearing to Key lime seedlings budded from affected trees.

CASTAÑO (J. J.). **Una afección nueva en Coffea liberica.** [A new disease of *Coffea liberica*.]—*Agricultura trop.*, 9, 1, pp. 29–31, 2 figs., 1 diag., 1953.

A planting of *Coffea liberica* seedlings under two years old in the greenhouse and another of ornamental species in the grounds of the National Centre for Coffee Investigations, Caldas, Colombia, were affected simultaneously by total defoliation preceded by the formation of coffee brown lesions on the stem and main branches. At first the lesions were localized at the nodes and on the leaf petioles but as the disease advanced to the internode the terminal parts of the branches rapidly wilted and died. A whitish mycelium was visible in the phloem and brown lesions in the wood. Invasion of the petiole was followed by yellowing of the leaf, the development of dry, reddish-brown areas resembling scorching, and finally defoliation.

Greyish erumpent or sub-epidermal, subglobose pycnidia about ½ mm. in diameter, typical of the genus *Phomopsis* [*R.A.M.*, 27, p. 280], were obtained from the stems. On potato dextrose agar the fungus developed black, lenticular to subglobose pycnidia measuring 150 to 300 μ at the longest point; short, filiform conidiophores; sub-fusiform or oblong, hyaline, biguttulate pycnospores 8 to 12 by 4 to 6 μ; and filiform, hyaline, S- or J-shaped stylospores 20 to 24 by 1 to 1·5 μ. No perfect state was observed. Pathogenicity was established by inoculating 1½-year-old seedlings in the greenhouse and in the field with mycelium and conidia into wounds at the nodes and in the stems and covering them with damp cotton.

STEVENSON (J. A.) & BEAM (ROSE). **An annotated bibliography of Coffee rust (Hemileia spp.).**—*Spec. Publ. Plant Dis. Surv.* 3, 80 pp., 1953. [Mimeographed.]

The authors consider that two species of *Hemileia* are responsible for coffee rust, *H. vastatrix* [*R.A.M.*, 32, p. 365] and the less important *H. coffeicola* [16, p. 379]. Most of the references listed were available in the library of the United States Department of Agriculture. Entries are arranged alphabetically under authors with a complete citation and brief notes indicating the contents of each publication.

SCHWINGHAMER (E.). **Physiologic specialization and the nature of parasitism in Colletotrichum linicolum Pethyb. & Laff.**—*Diss. Abstr.*, 14, 11, pp. 1896–1897, 1954.

Many cultural types of the flax anthracnose fungus, *Colletotrichum linicola*, some of them less virulent cultural variants, were studied at the University of Minnesota. Although the optimum soil temperature for damping-off of flax seedlings was 25° to 30° C. the differential intervarietal response was most pronounced at about 15°. Seedling inoculation in the cotyledon stage with a spore suspension provided the simplest and most selective method of testing isolates for pathogenicity, the most accurate results being obtained with a spore concentration of approximately 150 per cu. mm., a 24-hour exposure to high humidity, and a temperature of 60° F. In general, plant age was immaterial. Except for Crystal, commercial varieties grown in the United States were unsatisfactory as differentials. From a screening test of about 650 lines from the world flax collection the varieties Punjab, Ottawa 770B, Leona, C.I. 1016, C.I. 1235, and CI 1247 were selected for this purpose which permitted the separation of 42 monoconidial isolates of *C. linicola* into five distinct pathogenic race groups.

Virulent isolates generally produced appressoria and did not differ significantly in ability to penetrate cellophane membranes. In a susceptible host an appressorial infection peg entered the epidermal cell and enlarged apically to form a vesicle which subsequently branched to become the multi-lobed primary hypha. In highly resistant plants (Leona and C.I. 1235) the appressoria were unable to penetrate the epidermal cells, and the latter variety contained many individual necrotic cells in which fungus growth had been checked completely in the hyphal stage. The cotyledons of Ottawa 770B and C.I. 1016 displayed a range of reaction from non-penetration to lesions of various sizes. Of the commercial varieties inoculated in the seedling stage Crystal, Sheyenne, B5128, and Redwing possessed varying degrees of resistance to isolates of three race-groups of *C. linicola* while all varieties were susceptible to isolates of the other two groups. Varietal resistance to seed infection in plants inoculated in the boll stage was best evaluated by sowing the harvested seed in steamed soil and determining the percentage of seedlings with cotyledonary lesions. By this method B5128, Crystal, Redwood, Redwing, Sheyenne, Biwing, and Minerva were shown to be relatively resistant [*R.A.M.*, 28, p. 288].

New or uncommon plant diseases.—*Plant Path.*, 3, 3, pp. 105–106, 1954.

Elizabeth G. Gray reports that in January, 1954, cankers were found on nearly every stem of samples of rose briars recently imported into Scotland from Holland and West Germany. On the Dutch briars conidia of the *Coniothyrium fuckelii* type [cf. *R.A.M.*, 30, p. 370] were produced. On the German material the cankers, ½ to 3 in. long, occurred on blackened areas of bark, usually girdling the stem; pycnidia on these cankers emitted conidia (6 to 10 by 3 to 5 μ) attributed to *C. wernsdorffiae* [loc. cit.], not before recorded in England.

I. F. Storey and F. Joan Moore state that asters (*Callistephus chinensis*) from Mildenhall, Suffolk, were affected by small, usually round, light brown leaf spots with a darker border, and similar but canker-like stem lesions, both of which produced pycnidiospores (6 to 9 by 3 μ) of *Ascochyta asteris* [20, p. 506], not previously reported in England.

Brierley (P.) & Smith (F. F.). **New records of virus diseases of ornamental plants.**—*Plant Dis. Reptr*, 38, 11, pp. 739–741, 2 figs., 1954. [Multilithed.]

Aster yellows virus [*R.A.M.*, 33, p. 12], apparently not previously recorded on plants of the Violaceae or Saxifragaceae, caused vein-clearing and bright yellow leaf chlorosis of pansies (*Viola tricolor*) at the Plant Industry Station, Beltsville, Maryland, and vein-clearing and proliferation of the pistils into vegetative shoots in a single plant of Charm hydrangea (*Hydrangea macrophylla*) in Oregon. Western aster yellows virus caused commercial losses of gladiolus [see following abstract] in Kansas. Croft and Georgia Easter lilies (*Lilium longiflorum*) in a West Virginia greenhouse were infected by lily rosette virus [30, p. 322], believed to have been introduced in the Georgia variety. In inoculation experiments on Georgia characteristic rosetting occurred only in the year of infection while mild symptoms developed in the following years, making thorough roguing difficult.

Laburnum vein-mosaic is the name proposed for a disease, new to the United States, causing conspicuous vein-banding of *Laburnum alpinum* in Maryland. Tobacco ring spot virus was isolated from infected plants but there was no evidence that it is the cause of the disease.

Heinis (J. L.). **Gladiolus virus survey in Oregon in 1954.**—*Plant Dis. Reptr*, 38, 11, pp. 733–735, 2 figs., 1954. [Multilithed.]

A survey of gladiolus virus diseases [cf. *R.A.M.*, 33, p. 84], made in Oregon in 1954, disclosed an average of 21 per cent. infection by foliar viruses, including

mostly mild forms of [tobacco] ring spot, cucumber mosaic, yellow bean mosaic, and ring pattern (? a strain of tobacco ring spot virus).

Viruses attacking the flowers were white streak, affecting a low percentage of plants of a few varieties in the north and two plants in the south, and western aster yellows [see preceeding abstract], which was seen only on three plants. The marked reduction in the incidence of these two viruses indicates that roguing included in the clean up programme initiated by the State Department of Agriculture has been effective. Continued roguing is recommended for the control of the flower viruses and of severe cucumber mosaic and tobacco ring spot viruses.

Gagnotto (Anna-V.). **Osservazioni su Fusarium oxysporum Schl. var. gladioli Massey e prove di lotta contro di esso.** [Observations on *Fusarium oxysporum* Schl. var. *gladioli* Massey and experiments on its control.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 11 (*1953*), pp. 21–39, 2 graphs, 1954. [English summary.]

This paper on gladiolus corm rot (*Fusarium oxysporum* var. [f.] *gladioli*) in Italy has already been noticed from another source [*R.A.M.*, 33, p. 725].

Verneau (R.). **Marciume della corona fogliare di Howea forsteriana.** [Bud rot of *Howea forsteriana*.]—*Ann. Sper. agr.*, N.S., 7, 2, pp. 525–538, 1 pl., 5 figs., 1953. [English summary.]

A full account is given of a bud rot caused by *Phytophthora palmivora* affecting *Howea forsteriana* plants growing in tubs under orange trees in a garden at Portici, Italy. Control measures suggested comprise improving aeration and light, removing all affected parts, spraying the stem and leaf sheaths with 1 per cent. Bordeaux mixture, sprinkling the soil in the tubs with 1 in 5,000 copper sulphate solution, sterilizing the soil and the containers, avoiding the use of manure, irrigating with clean water, to which a dilute solution of copper is added occasionally, and insecticidal measures to control possible vectors of the fungus.

Bakker (Martha) & Scholten (G.). **Ein bacterie-verwelkingsziekte in Amerikaanse Anjers.** [A bacterial wilt disease in American Carnations.]—*Tijdschr. PlZiekt.*, 61, 1, pp. 7–10, 4 figs., 1955. [English summary.]

Bacterial wilt of carnations caused by *Pseudomonas caryophylli* [*R.A.M.*, 33, p. 723] was observed for the first time in Holland in 1951. The morphological and physiological properties of the Dutch isolate agreed in nearly all respects with those reported by Burkholder from the United States [21, p. 325], except that the former produces a pellicle on nutrient broth and evolves gas from dextrose, galactose, and sucrose. The disease was probably introduced into Holland on American cuttings. No indication of resistance was given by any of the 16 varieties used in inoculation experiments, which resulted in collapse of the plants by the end of three months. The most promising method of control is the destruction of all plants in the affected greenhouses, followed by steam sterilization of the soil.

Munnecke (D. E.). **Bacterial stem rot and leaf spot of Pelargonium.**—*Phytopathology*, 44, 11, pp. 627–632, 2 figs., 1954.

Of recent years bacterial stem rot and leaf spot of *Pelargonium hortorum* (*Xanthomonas pelargonii*) has drastically restricted the production of cuttings from field-grown plants in California [cf. *R.A.M.*, 11, p. 650; 32, p. 678]. No commercial variety was found to be immune from stem rot, though Salmon Supreme and Better Times were only slightly susceptible. Salmon Supreme was also immune from the leaf spot phase in unpublished inoculation experiments by L. H. Davis in 1950, and Madam Buchner highly resistant. Several unknown varieties of *P. peltatum* were susceptible, but *P. domesticum* (Martha Washington) contracted no

infection in inoculation tests and remained healthy in fields adjacent to severely diseased *P. hortorum*.

The bacteria inhabit the vascular elements and are perpetuated by means of contaminated cuttings taken from symptomless or obviously diseased plants, or in recently infected soil. They may survive for at least three months in moist field soil and are disseminated primarily by cutting knives, as well as by contact and splashing water.

A programme of field control, comprising the establishment of disease-free planting stock, the practice of annual rotation, and stringent sanitation, has been adopted by several commercial firms.

Robison (R. S.), Starkey (R. L.), & Davidson (O. W.). **Control of bacterial wilt of Chrysanthemums with streptomycin.**—*Phytopathology*, 44, 11, pp. 646–650, 1 fig., 1954.

At the New Jersey Agricultural Experiment Station both streptomycin and oxytetracycline proved effective in the control of bacterial wilt of chrysanthemum (*Erwinia chrysanthemi*) [*R.A.M.*, 33, p. 355] on the Indianopolis White, White Blanch, White Shasta, Reward, and White Popcorn varieties. The former conferred protection at lower concentrations (50 or 75 p.p.m.) than the latter and was less toxic to the plants, in which its activity persisted for several weeks. The antibiotic was applied by holding cuttings in a solution, planting cuttings and rooted plants in treated sand, or dipping cuttings in a hormone rooting powder containing 1 per cent. streptomycin.

Drechsler (C.). **Association of Aphanomyces cladogamus with severe root rot of Pansies.**—*Sydowia*, 8, 1–6, pp. 334–342, 4 pl., 1954.

The species of *Aphanomyces* originally isolated from pansies affected by a severe root rot in and near Washington, D.C. [*R.A.M.*, 13, p. 379] has been identified on the basis of biological relationships and morphological characters as *A. cladogamus* [33, p. 690]. The average oogonial and oospore diameters of the pansy fungus were 25·8 and 21 μ respectively. Encysted zoospores, mostly 7 to 8 μ in diameter, were produced in great abundance but no motile ones. The isolate from pansy readily attacks seedlings of the three hosts, tomato, chilli, and spinach, on which *A. cladogamus* also occurs naturally [loc. cit.], causing heavy losses from damping-off.

Cotta (W. J.) & Howard (F. L.). **Black spot of Helleborus.**—Abs. in *Phytopathology*, 44, 9, p. 485, 1954.

The commercial culture of *Helleborus niger* [in the United States] is severely restricted by black spot (*Coniothyrium hellebori*) [*R.A.M.*, 30, p. 612], the conidia of which produce lesions on the aerial organs during wet weather, especially in the spring and autumn. The minimum, optimum, and maximum temperatures for conidial germination in the authors' experiments were under 4°, 18° to 24°, and about 34° C., respectively. The temperature range for mycelial growth was the same, except for an optimum at 15°. The fungus grew on various vegetable substrata but not on cellulosic materials; on potato dextrose agar it developed over a pH range from 2·5 to 9·5, with an optimum between 5·5 and 6·5. The conidial germ-tube penetrates directly through the leaf epidermis or enters the trichomes, and the intercellular mycelium causes a dark brown discoloration of the invaded tissues. The inoculation of attached leaves on potted plants and of excised leaves results in the formation of lesions between 7° and 24° but not at 4° or 30°. Continuous wetting for 25 hours was requisite for conidial germination and subsequent foliar infection. Only immature leaves were susceptible, mainly the lower surface. Leaf injuries do not serve as channels of ingress for the pathogen. Captan was the

best of seven fungicides applied to one- and two-year-old plants. In laboratory tests phenyl mercury acetate was most toxic to the conidia and mycelium, but it was harmful to one-year-old plants at a dosage of 1 pint in 100 gals. water.

Basile (Rita). **Coryneum microstictum Berkeley et Br. su foglie di Arbutus unedo.** [*Coryneum microstictum* Berkeley & Br. on leaves of *Arbutus unedo*.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 11 (*1953*), pp. 261–267, 4 figs., 1954. [English summary.]

In November, 1951, the author isolated *Coryneum microstictum* [cf. *R.A.M.*, 18, p. 598] from leaves of *Arbutus unedo* collected in a garden at Rome. On the upper surface of the leaves the spots were about 2 mm. in diameter with a whitish, squamiform centre surrounded by a dark ring delimited by a reddish-brown halo; on the lower they appeared uniformly brown. Later, they increased to 4 mm. in diameter and became necrotic. Inoculations of detached leaves of a wild *Arbutus* sp. gave rise to spots in about ten days, and the pathogen was re-isolated. Hitherto, in Italy, the fungus has been found on *Arbutus* only on dead or dying branches.

Jenkins (Anna E.), Miller (J. H.), & Hepting (G. H.). **Spot anthracnose and other leaf and petal spots of Flowering Dogwood.**—*Nat. hort. Mag.*, pp. 57–69, 4 pl., 1 map, 1953.

The most important disease affecting the flowering dogwood [*Cornus florida*] in the eastern United States is spot anthracnose, caused by *Elsinoe corni* [*R.A.M.*, 32, p. 81], which causes spots on bracts, leaves, and berries and cankers on twigs. Petal blight (*Botrytis cinerea*) [30, p. 613] affects early flowers and frequently young shoots in wet weather following late frosts. Leaf spot and blight due to *Ascochyta cornicola* may cause the foliage of whole trees to blacken and shrivel during an epiphytotic. Control is effected by spraying five times at three-weekly intervals with a Du Pont fixed-copper fungicide incorporating a sticker-spreader. *Septoria floridae* and *Cercospora cornicola*, often occurring together, cause minor leaf spots. They may be controlled by Bordeaux mixture spray at 2- or 3-weekly intervals, beginning when the leaves are fully grown [see next abstract].

Cox (R. S.) & Heuberger (J. W.). **Control of spot anthracnose and Septoria leaf spot of Flowering Dogwood.**—*Nat. hort. Mag.*, p. 70, 1953.

Experiments under nursery conditions in Delaware, United States, in 1952, have established that several fungicides show considerable promise for the control of spot anthracnose [*Elsinoe corni*] and *Septoria* leaf spot [*S. floridae*: see preceding abstract] on dogwood. The recommended programme is to use orthocide 406 [captan], 2 lb. in 100 gals. water, or manzate, 1½ lb. in 100 gals. water, spraying at blossom opening and at monthly intervals throughout the summer.

Erwin (D. C.). **Relation of Phytophthora cryptogea and other Phytophthora species to root rot of Alfalfa in California.**—Abs. in *Phytopathology*, 44, 9, p. 487, 1954.

The isolate of *Phytophthora cryptogea* obtained from lucerne in California [*R.A.M.*, 33, p. 358] was shown to differ in pathogenicity from other strains of the same species, being innocuous to aster and tomato roots and causing no decay on those of cotton, sugar beet, carrot, flax, sweet clover [*Melilotus* sp.], Ladino and red clovers, bean [*Phaseolus vulgaris*], vetch, cowpea, and trefoil [*Lotus* sp.]. *Medicago falcata* (diploid and tetraploid), *M. arborea*, *M. glutinosa*, and *M. lupulina* were susceptible to the lucerne strain of *Phytophthora cryptogea*. Lucerne was not attacked by *P. parasitica*, *P. cinnamomi*, *P. drechsleri*, *P. palmivora*, or four unidentified strains from other hosts.

Barber (S. A.). **Boron deficiency in Indiana soils.**—*Sta. Circ. Ind. agric. Exp. Sta.* 387, 2 pp., 4 figs., 1953.

The only Indiana field crop which is injured by boron deficiency is lucerne [*R.A.M.*, 24, p. 406]. In areas where this occurs borax should be broadcast on the established crop at the rate of 20 to 30 lbs. per acre every two or three years.

Ciccarone (A.). **Osservazioni su un'alterazione del Trifoglio alessandrino causata da Stagonospora recedens (Massal.) Jones et Weimer f. trifolii-alexandrini n.f. e cenni sulla posizione sistematica del parassita e delle forme ad esso vicine interessanti le Papilionacee trifoliee.** [Observations on a disease of *Trifolium alexandrinum* caused by *Stagonospora recedens* (Massal.) Jones & Weimer f. *trifolii-alexandrini* n.f. and notes on the systematic position of the parasite and of related forms attacking the trifoliate Papilionaceae.]—*Ann. Sper. agr.*, N.S., 7, 2, pp. 461–475, 5 figs., 1953. [English summary.]

This account of the leaf spot of *Trifolium alexandrinum* growing near Rome, caused by a fungus provisionally regarded as a new form and named *Stagonospora recedens* f. *trifolii-alexandrini* n.f. is an expanded version of work already noticed from another source [*R.A.M.*, 32, p. 423]. [The same paper also appears in *Boll. Staz. Pat. veg. Roma*, Ser. 3, 11 (*1953*), pp. 41–55, 1954.]

Marcelli (E.). **Un mosaico del Trifoglio ibrido riferibile al mosaico giallo N. 2 del Fagiolo.** [A mosaic of hybrid Clover attributed to the yellow mosaic virus No. 2 of Bean.]—*Ann. Sper. agr.*, 7, 4, pp. 1267–1272, 2 figs., 1953. [English summary.]

This is an expanded version of a paper on the disease in Italy already noticed [*R.A.M.*, 32, p. 628].

Chilton (J. E.). **Volutella species on Alfalfa.**—*Iowa St. Coll. J. Sci.*, 27, 2, pp. 142–143, 1953.

Besides the saprophytes *Volutella gilva* and *V. ciliata*, the author discusses the unreported parasite of lucerne and red clover (*V.* sp.), an account of which has already been noticed from another source [*R.A.M.*, 31, p. 332].

Hilder (E. J.) & Spencer (K.). **The influence of sulphur on a natural Medicago pasture.**—*J. Aust. Inst. agric. Sci.*, 20, 3, pp. 171–176, 2 figs., 1 graph, 1954.

An account is given of an experiment carried out on a property situated on the northern foothills of the Liverpool Range, near Willow Tree, New South Wales, where the general appearance of the sown pastures indicated sulphur shortage [*R.A.M.*, 33, p. 234]. On 18th April, 1952, superphosphate (22 per cent. phosphorus pentoxide) and agricultural gypsum were drilled into the undisturbed surface separately and together to give seven treatments with sulphur equivalent to 0, 9·2, 15·3, 21·1, 21·6, 34·8, and 67·2 lb. per acre, and phosphorus at 0, 8·1, 0, 18·6, 10·4, 11·6, and 11·6 lb. per acre. The sward was left ungrazed.

Six weeks later there was marked improvement in the growth of medick (chiefly *Medicago denticulata*, *M. minima*, and *M. orbicularis*) wherever the fertilizers had been applied. By the 16th week the dark green, vigorous plants (12 to 18 in. high) on these plots were in striking contrast to the pale green, stunted plants (3 in. high) on the untreated. At sampling on 12th August *M. minima* was the dominant legume on the control plots, whereas *M. denticulata* and *M. orbicularis* were entirely dominant on the fertilized plots. Large, branched, pinkish nodules were present on the treated plants, and small, scattered, unbranched nodules with a greenish pigmentation near the base on the untreated.

Yield figures showed a very great increase in productivity in all fertilized plots, most of the increase being due to the medick. The maximum possible yield of

medick was estimated at 24·3 cwt. per acre. The untreated plots gave only 15 per cent. of this, whereas 20 lb. per acre of sulphur (equivalent to nearly 1 cwt. of gypsum or to 2 cwt. of superphosphate) gave up to 90 per cent. Increase in total forage due to sulphur was fourfold. There was no response to phosphorus in superphosphate. Total sulphur and total nitrogen contents of the herbage increased steadily with increasing levels of sulphur application.

WATERHOUSE (W. L.). **Australian rust studies. XII. Specialization within Uromyces striatus Schroet. on Trigonella suavissima Lindl. and Medicago sativa L.** —*Proc. Linn. Soc. N.S.W.*, 78, 3–4, pp. 147–150, 1 pl., 1953. [Received 1955.]

In a further contribution to this series [cf. *R.A.M.*, 32, p. 617] *Uromyces striatus* [29, p. 288], isolated from heavily infected plants of *Trigonella suavissima* from Lake Menindie, New South Wales, was found to be pathogenic to lucerne. Four other species of *Trigonella* from Italy, Israel, Armenia, and Iran proved to be resistant to the New South Wales strains of the rust, developing only 'flecks' or small pustules on the necrotic areas. In further inoculation tests with 22 species of *Medicago*, *M. tribuloides*, *M. obscura*, *M. rigidula*, *M. tuberculata*, *M. hispida* [cf. 31, p. 577], and *M. lupulina* were resistant to isolates from both genera. It was evident from the reactions of the other species that the two rusts represent distinct physiologic races, and further evidence was obtained that those in New South Wales are distinct from the United States strain.

BASU-CHAUDHARY (K. C.). **Effect of temperature on the survival of the rust of Bajra caused by Puccinia penniseti Zimm.**—*Agra Univ. J. Res. (Sci.)*, 4, 1, pp. 31–33, 1955.

At the Botany Department, Agra University, India, uredospores of *Puccinia penniseti* collected from *Pennisetum typhoides* [*R.A.M.*, 33, p. 31] lost their capacity to germinate in the laboratory after 12 hours at 49° to 50° C. and after eight days at 41° to 42°, while at 14° the viability lasted 150 days. It is concluded that the pathogen cannot survive in the uredospore stage during the summer on the plains round Agra, where the mean temperature for May and June is 40° to 41° and frequently reaches 45·8°.

FISCHER (G. W.). **Evidence of complex physiological heterothallism in Ustilago striiformis hordei.**—*Res. Stud. St. Coll. Wash.*, 21, 1, pp. 57–72, 1953.

The sexuality of *Ustilago striiformis hordei* [cf. *R.A.M.*, 31, p. 72] was investigated using monosporidial cultures obtained from spores collected on *Agropyron* and *Elymus* spp. By means of pairing experiments compatibility groups were demonstrated and the author concludes that these groups in the Ustilaginales should not be considered as true sexes but rather as mating types.

WINTERSTEEN (H.). **The response of ten clonal lines of Bromus inermis to infection by Selenophoma bromigena.**—*Phytopathology*, 44, 11, pp. 655–656, 1954.

At the Iowa Agricultural Experiment Station ten selected clonal lines of *Bromus inermis* were observed to show significant differences in resistance to infection by *Selenophoma bromigena* [*R.A.M.*, 29, p. 407]. Five consistently reacted in greenhouse inoculation tests only by flecking and may prove to be of value as resistant parents in breeding experiments.

SCHICHT (F.). **Schädlinge und Krankheiten der Sonnenblume.** [Pests and diseases of the Sunflower.]—*Dtsch. Landw.*, 6, 3, pp. 138–142, 13 figs., 1955.

Semi-popular descriptions are given of the sunflower diseases caused by *Sclerotinia sclerotiorum* and *Botrytis* sp. in the Salzmünde district of Germany.

Van Katwijk (W.). **Ruwschilligheid bij Appels, een virus-ziekte.** [Rough skin of Apples, a virus disease.]—*Tijdschr. PlZiekt.*, 61, 1, pp. 4–6, 2 figs., 1955. [English summary.]

For some years past the Beauty of Boskoop and Glory of Holland apple varieties have sustained progressively more severe damage in Holland from a disease known as 'rough skin' [see next abstract], which causes the formation on the skin of rough, brown patches, stripes, and in some cases rings, but very rarely cracks. The growth of the fruits is checked and they are assigned to inferior commercial grades. Spread occurs in the crown and the number of diseased trees in an orchard increases over a period of several years, sometimes very rapidly. Rough skin was shown by experiments on Beauty of Boskoop to be due to a graft-transmissible virus, for which the name of *Pyrus* virus 8 is proposed.

Mulder (D.). **Ruwschillige vruchten en een bladsymptoom bij Appel.** [Rough-skinned fruits and a leaf symptom in Apple.]—*Tijdschr. PlZiekt.*, 61, 1, pp. 11–14, 9 figs., 1955. [English summary.]

The symptoms of rough skin virus differ in some degree on the several apple varieties affected in Holland [see preceding abstract]. Thus, on Beauty of Boskoop spots of variable size are accompanied by band-shaped, corky areas extending from the calyx to the point of attachment to the petiole. On Glory of Holland and Notaris these manifestations are supplemented by rings and lines, while small, isolated, corky spots are the only signs of the disease on Dijkmanszoet and Golden Delicious. The latter variety and Beauty of Boskoop develop fissures on the skin as a result of suberization. A genetic abnormality affecting Beauty of Boskoop may be distinguished from the foregoing both by the time of its occurrence at an early stage in the development of the fruit and by its extension over the whole surface. Large cracks are formed in the skin which leave scars on healing.

Conditions similar to rough skin have long been observed by H. R. Kristensen in Denmark on Beauty of Boskoop, Golden Delicious, and Gravenstein and by A. Loewel in the Hamburg district of Germany on Beauty of Boskoop and Laxton's Superb. Beauty of Boskoop and other varieties are also affected in Switzerland. There is a considerable likeness between rough skin and the green crinkle virus of New Zealand [*R.A.M.*, 31, p. 612], but in the latter disease the rough spots occupy depressions in the skin. Rough skin further presents various analogies with stony pit virus of pears [31, p. 477], in which, however, the formation of dark green spots directly below the epidermis is followed by cell necrosis and the development of a surrounding cork layer. In rough skin of apples the cork is formed on the surface, presumably after the death of the epidermal cells or those immediately underlying them.

During the summer of 1954 local vein-clearing was observed on the top leaves of Glory of Holland apple shoots and in a less conspicuous form on those of Beauty of Boskoop and Golden Delicious. From the results of grafting experiments it is presumed to be a symptom of rough skin virus.

Jacks (H.). **Orchard spray trials in 1951–52, 1952–53.**—*Orchard N.Z., 1952, Suppl.*, pp. ii–viii, 1952; *1953, Suppl.*, pp. 1–11, 1953.

These are condensed summaries of the experiments (with results) carried out on a variety of fruits and also hops by the author in collaboration with W. J. Biggar, J. E. Hawkins, R. E. Robbins, O. Winn, T. P. Lidgard, R. Nodder, H. W. Rosser, and A. J. Webb of the Department of Scientific and Industrial Research, Auckland, New Zealand.

Against apple black spot (*Venturia inaequalis*) [*R.A.M.*, 34, p. 303] in 1951–2 on Parlin's Beauty Bordeaux mixture (10–8–100) followed by lime-sulphur and

then colsul reduced leaf scab from 79·1 per cent. to between 12·3 and 36·6 per cent. Adhesives did not give significantly better control nor did applications later than four weeks after petal fall. The omission of spraying two weeks after petal fall appeared to have an important effect. On Jonathan the same schedule and also ascospray, venturicide, fermspray, thirospray, SR–406 [captan], and crag 341C all reduced fruit scab (0 to 2 per cent. compared with 17 per cent. for the control), and all except the last two-named reduced leaf scab (from 100 per cent. to a range of 61·8 to 75 per cent.). The percentage of fancy fruit was reduced by russetting by all treatments except ascospray, venturicide, and captan. On Granny Smith, the best treatments were sulphurs followed by Bordeaux mixture (1·6 per cent. fruit scab) and ascospray (2·8 per cent.; control 87·2 per cent.). On Dunn's [Favourite] ascospray at two strengths allowed 1·1 and 2·9 per cent. fruit infection and 4 and 0 per cent. leaf infection compared with 29·3 (fruit) and 32 (leaf) per cent. on the most severely infected trees; at 2 lb. per 100 gals., however, this fungicide caused foliage damage.

Against apple ripe spot (*Neofabraea malicorticis*) [33, p. 91; 34, p. 214] on Sturmer and Delicious two applications of zirospray at 2 lb. per 100 gals. reduced infection to less than 1 per cent.

When fermspray (7 lb.) was combined with summer oil (1 per cent.) it left an unsightly deposit on Sturmer and Ballarat fruit which could not be removed; alone it reduced the yield of Cox's Orange considerably.

Pear black spot (*V. pirina*) [33, p. 308] on Winter Nelis was reduced from 79·5 per cent. on the unsprayed to 3 to 6·1 per cent. by (*a*) 11 applications of Bordeaux mixture (10–8–100; 6·8–6·8–100; 1·5–2–100), (*b*) ten of fermspray (2 lb.), (*c*) ten of thirospray (2 lb.), and (*d*) four of ascospray (2 lb.) followed by seven of Bordeaux; (*a*) doubled the amount of russet.

The work on peach brown rot (*Sclerotinia fructicola*) has already been noticed [33, p. 733].

In 1950–1 *Uncinula necator* on the vine variety Albany Surprise grown in open fields was reduced from 48·4 per cent. infection (unsprayed) to 1·5 per cent. by three sprays of cuprox (5 lb.) or Bordeaux mixture (6–8–100) both plus 12 oz. agral L and both followed by two of lime-sulphur (1 gal.) plus colsul-40 (2 lb.). In 1950–52 the greatest reductions (62·1 per cent. to 7·9 and 8·1) were given by the same treatments and also by four sprays of shirlan AG (3 lb.). A number of other fungicidal combinations also gave significant reductions in both years. Serious spray damage on Black Hamburg under glass resulted from one application of phygon XL at 0·5 or 0·25 lb. whereas Albany was not affected.

In 1952–3 colloidal copper sprays (20 lb. followed by 10 lb. followed by 5 lb.) reduced *V. inaequalis* on the apple variety Parlin's Beauty from 66·3 per cent. (unsprayed) to 4·4, and ascospray (2 lb.) followed by thirospray (2 lb.) to 13·4 per cent. Trees treated with colloidal copper were severely damaged by early December. Granny Smith treated with fungex showed only 9·3 per cent. scab but the crop was ruined by russetting; with zirospray and flit 406 [captan] the percentages were 25 and 26·6, respectively, compared with 95·3 on the controls. Moderate defoliation but superior scab control was achieved with two schedules both incorporating winter oil (5 per cent.), ascospray (2 lb.), D-spray 50 ($\frac{1}{2}$ lb.), thirospray (2 lb.), and summer oil than by one comprising lime-sulphur and colloidal sulphur followed by thirospray and D-spray 50 on Cox's Orange, giving 3·2, 1·2, and 4·5 per cent. infected fruit, respectively. Less severe defoliation occurred on Dunn's, the same treatments giving 2·1, 0·6, and 3·9 per cent. infection. On Delicious there were no significant differences between the treatments, with 4·6, 3·4, and 3·7 per cent., and the foliage was uninjured.

The best treatment against *N. malicorticis* on Sturmer apple consisted of two applications of Bordeaux mixture (2–6 and 1–4), while fairly good control was

given by two of zirospray (2 lb.), giving 10 and 17 per cent. infected fruit, respectively. The Bordeaux mixture retarded fruit ripening.

In the control of *V. pirina* on Winter Nelis pears the most effective schedule was one of Bordeaux mixture (10–8 and 6–8), followed by thirospray (2 lb.) and then Bordeaux (6–8 dropping to 1½–2) again, giving 15·4 per cent. infection compared with 99·7 for the unsprayed.

S. fructicola on Golden Queen peaches was reduced from 94·5 per cent. (controls) to 12·2 and 13·4 by phygon XL (½ lb.) with magnesium sulphate (½ lb.) and phygon XL alone, respectively. This treatment blemished the fruit and retarded maturation.

Williams (E. B.). **The inheritance of pathogenicity and certain other characters in Venturia inaequalis (Cke.) Wint.**—*Diss. Abstr.*, 14, 11, p. 1897, 1954.

Genetic studies at Purdue University [Lafayette, Indiana], demonstrated that race 2 of *Venturia inaequalis* [*R.A.M.*, 34, p. 231] differs from the common race 1 in its ability to attack *Malus baccata* var. Dolgo and certain segregates of the Russian apple *M. pumila* R12740–7A [33, p. 487]. Race 3 differs from 1 in its ability to attack *M. p. niedzwetzkyana* var. Geneva. These reactions were controlled by three different genes designated dolgo (d^+), russian (r^+), and geneva (g^+). The gene green (*gr*) controls green mycelial colour, mating type (mt^+) ascus development, and sikkless (*s*), a reduced virulence reaction (pinpoint pits) on *M. sikkimensis*. Another gene, sikkless′ (*s′*), phenotypically identical with *s* but probably not allelic, was identified in the green parental stock. From matings *in vitro*, serial isolations of ascospores, and genotypic determinations by cultural methods or host inoculations under controlled greenhouse conditions it was found that *s*, d^+, and r^+ were linked in that order, *s* nearest the centromere, *s* and d^+ being 25 crossover units apart and d^+ and r^+ 9·7 (uncorrected for double crossovers); g^+, *s′*, *gr*, and mt^+ were inherited independently of each other and of the three linked genes. Five new recombinant strains with respect to pathogenicity were obtained.

Glass (E. H.), Hamilton (J. M.), Lienk (S. E.), & Szkolnik (M.). **How shall we apply orchard sprays?**—*Fm Res.*, 19, 2, pp. 14–15, 2 figs., 1953.

Comparative spray tests in apple orchards in Geneva, New York, showed that the best control of apple scab [*Venturia inaequalis*: cf. *R.A.M.*, 33, p. 158] in an eight- to ten-day spray schedule was given by tag at eight times the normal concentration in an air-blast sprayer at the rate of 1·9 gals. per tree. This treatment reduced scab on McIntosh apples from 100 per cent. in the untreated controls to 0·2, and in Cortland apples from 95·9 per cent. to 0·3. Normal concentrations of tag at 14·7 gals. per tree reduced scab in the two varieties to 0·7 and 0·5 per cent. respectively. In tests with crag 341, fermate, and micronized sulphur, in each case better scab control was obtained using a greater concentration of fungicide applied with a mistomatic spray apparatus.

The relative advantages and disadvantages of spraying with dilute or concentrated fungicides are summarized; it is concluded that growers must make their own decisions with due regard to their particular orchard conditions.

Taylor (R. E.) & Byrde (R. J. W.). **Control of Nectria eye-rot of Apple by an eradicant fungicide.**—*Plant Path.*, 3, 3, p. 72, 1954.

On 12th March, 1953, 40 gals. of an eradicant fungicidal spray containing 0·3 per cent. phenyl mercury chloride were applied to 12 Worcester Pearmain apple trees in a Herefordshire plantation known to be subject to infection by *Nectria galligena* [*R.A.M.*, 32, p. 567]. On 12th August, 1953, about ten days before harvest, the sprayed trees averaged 0·17 per cent. fruits infected with *Nectria* eye-rot, as against 2·83 per cent. for the same number of unsprayed, adjacent trees. The

result confirms earlier observations that the conidia of *N. galligena* are not carried more than 30 ft. from a canker, and are dispersed by rain rather than by wind [19, p. 27].

Canova (A.). **Cascola parassitaria delle gemme di Melo.** [Parasitic bud rot of Apple.]—*Ann. Sper. agr.*, N.S., 7, 2, pp. 355–367, 10 figs., 1953. [English summary.]

An account is given of the symptoms, causal organism, and epidemiology of a bud rot of apples (*Fusarium lateritium* var. *fructigenum*) [*F. lateritium*: cf. *R.A.M.*, 17, p. 466; 26, p. 157] which since 1950 has reduced yields in certain orchards in Reggiolo (Reggio Emilia), Italy, and in various other provinces, particularly Mantua. The varieties affected are Drappo dorato, Paradiso, Campanino, Carla, Annurca, Red Stayman, Commercio, Durello, King Davis, Decio nostrana, and Permaine doré. In the first two varieties all the flower-buds and many of the leaf-buds are affected; in the others the percentage of infected buds is about 20. Bordeaux mixture failed to give satisfactory control. Further work is in progress.

Melville (F.) & Hardisty (S. E.). **Scald in Granny Smith Apples.**—*J. Agric. W. Aust.*, Ser. 3, 2, 1, pp. 101–103, 105–107, 109–111, 113–115, 117, 4 figs., 1953.

A survey made in 1946 showed that more than one-third of the apple trees grown in Western Australia were of the Granny Smith variety, and since then new plantings and re-workings have been mainly of this variety. It is subject to scald, of which two forms occur, sunburn and superficial. Sunburn scald, occurs as a smooth, shiny brown to ebony black discoloration, usually roughly circular and confined to one face of the apple. Superficial scald [cf. *R.A.M.*, 33, p. 360] develops as slightly sunken, dull brown, irregular areas which may cover most of the surface; well grown, sappy fruits are most susceptible, particularly those in protected parts of the tree. Occasionally, the two types of scald develop on opposite faces of the same apple. Both types result from low temperature storage, but sometimes the injury does not become prominent until the fruit has been removed from storage and kept at atmospheric temperatures for a few days. The first sign of scald normally appears in about four months. Sunburn scald appears first, and generally becomes prominent by about the fifth month. Superficial scald becomes very serious by the seventh month. Incidence of superficial scald is affected by climatic, seasonal, and environmental conditions. For instance, at Karragullen fruit picked at the beginning of April in each of the three years 1950–2 had under 10 per cent. scald in November, 1950, over 90 per cent. in 1951, when growing conditions were ideal, and under 30 per cent. in 1952.

In normal commercial conditions, in which the fruit is wrapped in oiled paper before storage, superficial scald presents a problem only in fruit picked before the end of the third week in April; in the absence of oiled wraps, however, it may also appear on fruit picked up to early May. Delayed harvesting is generally impracticable. Complete wrapping is necessary to produce a satisfactory result. The best control from a practical point of view was obtained by wrapping apples picked in April and storing as soon as possible at 38° to 40° F. until the end of May, then at 32° for the remainder of the storage period. Adequate ventilation of the storage chamber is essential, especially during the initial stages. Fruit of a superior appearance and condition and almost completely free from superficial scald was obtained by this method. No effective means of preventing sunburn scald was discovered.

Ark (P. A.) & Scott (C. E.). **Antibiotics as protectants against fireblight.**—Abs. in *Phytopathology*, 44, 9, p. 481, 1954.

In tests for the control of fireblight [*Erwinia amylovora*] on Bartlett pears in

California by spraying with 100 p.p.m. crude streptomycin [*R.A.M.*, 33, p. 94: 34, p. 231] at 25 per cent. bloom, 35 per cent. full bloom, calyx, and three times more, there were 0·602 cuts for the disease per tree, as against 0·688, 2·09, 0·645, and 0·924 for trees dusted with copper-lime, untreated, and sprayed with 50 and 25 p.p.m. streptomycin, respectively. In another trial the cuts per tree after spraying with 100, 25, and 10 p.p.m. streptomycin numbered 0·2, 0·49, and 6·9, respectively, compared with 6·94 in the controls. The application of the antibiotic at 100 p.p.m. to half of each of eight Jonathan apple trees at full bloom, petal-fall, and calyx reduced the number of fireblight infections from 91 on the unsprayed halves to 15. The injection of dry streptomycin in amounts of up to 3·6 gm. per tree into pear trunks failed to arrest hold-over cankers but caused no injury. There were 2·77, 4·45, and 4·15 cuts per tree in tests with neomycin sprays as against 10·21 in the untreated, while four applications of aureomycin at 25 p.p.m. increased the number of cuts from 4·22 to 8·48.

Paunović (S. A.). Мозаика на неким сортама Бресака. [Mosaic on some Peach varieties.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1953*, 18, pp. 49–54, 1953. [English summary.]

During the summer of 1952 peach mosaic virus [*R.A.M.*, 31, p. 335] was observed in peach orchards in the village of Lipnica and at the Institute of Fruit Cultivation, Čačak, Yugoslavia. The disease, which caused as much as 100 per cent. infection on some varieties, was characterized by two kinds of leaf symptoms. On the varieties La France, Large Baden, and Griepenkerl 35 to 40 large, polygonal spots appeared scattered all over the leaf surface, resulting in partial chlorosis and severe leaf deformation. On the leaves of the Chinese Flat peach, however, 95 to 110 minute concentric ring spots were scattered all over the leaf surface causing partial chlorosis only. Fruit symptoms, though not manifested externally, were expressed in the lowered quality of the fruit, which was particularly poor in La France and Large Baden.

Preventive control measures recommended include cultivation of peach varieties which have hitherto been free from the disease, the use of grafting buds from healthy trees only, disinfection of tools, destruction of other hosts such as *Prunus angustifolia*, *P. monsoniana*, and *P. americana* if present up to a distance of 1500 m., and strict quarantine measures.

Diener (T. O.) & Dekker (C. A.). **Isolation and identification of L-pipecolic acid from western-X diseased Peach leaves.**—*Phytopathology*, 44, 11, pp. 643–645, 1954.

Paper chromatographic analysis of free amino acids in peach leaves affected by western X-disease [? strain of peach X-virus] and systemic arsenic toxicity in various counties of Washington revealed a ninhydrin-reacting substance which could not be detected in extracts prepared from healthy foliage. It was isolated from the diseased specimens by column chromatographic methods (*Biochem. J.*, 53, pp. 474–478, 1953) and identified as L-pipecolic acid.

Millikan (D. F.). **Studies of the ringspot virus complex in sweet Cherry.**—*Diss. Abstr.*, 14, 11, p. 1901, 1954.

Inoculation studies at the University of Missouri indicated that sweet cherry varieties fall into two groups as regards cherry [necrotic] ring spot virus infection [*R.A.M.*, 31, p. 497; 33, p. 678]. One, including Lambert and Napoleon, is very sensitive, the reaction varying from the killing of a few spurs to the death of the entire tissue down to the rootstock. The less sensitive group, including Gold and Hardy Giant, develops chlorotic spotting that may or may not become necrotic. Regional isolates of ring spot or yellows differed from each other no more than those

from the same region. Furthermore, when ring spot strains collected from different hosts were inoculated into the same host they produced symptoms so similar that there appears to be little reason to consider them as belonging to different virus groups. On the other hand the latent group [34, p. 131] does not appear to be very closely related to the necrotic ring spot strains [see next abstract].

A three-year study demonstrated that a factor significantly reducing the growth of year-old nursery trees in the middle of the growing season was present in cherry stocks propagated from non-indexed sources and trees artificially infected with ring spot. The possibility of this factor being the ring spot virus emphasizes the need to eradicate the disease.

A procedure for extracting nucleic acids from cherry leaves is described. Ring spot leaves contain approximately 50 per cent. more ribose nucleic acid than healthy ones.

Fridlund (P. R.). **Studies on virus diseases infecting hardy Prunus grown in Minnesota nurseries.**—*Diss. Abstr.*, 14, 11, p. 1862, 1954.

When inoculated at the University of Minnesota with 65 budwood samples from little-investigated, winter-hardy, local *Prunus* varieties, *P. tomentosa* developed symptoms of [cherry] necrotic ring spot virus as readily as any of the commonly used index hosts [*R.A.M.*, 30, p. 572 and preceding abstract]; it also detected and differentiated at least two additional, previously unidentified, latent viruses. The symptoms of necrotic ring spot in *P. tomentosa* were unique and included shoot die-back, mottling, necrotic spotting, and shot-holing of the leaves, chlorotic ring-spotting, leaf rugosity, and general stunting. Cultures of the virus differed in infectivity and symptom production in *P. tomentosa* and six other species. In 13 cross-protection tests in *P. tomentosa* seedlings cross-protection was complete in 12 combinations and partial in the other, showing that the same virus was involved. In potted *P. tomentosa* seedlings, a cutting-propagated clone, and a clone budded on *P. americana* rootstocks the individual response to transplanting appeared to be more important in causing symptom diversity than the genetic differences of individual seedlings. The various cultural and environmental practices studied did not seem to affect the number of inoculated *P. tomentosa* seedlings developing symptoms. A high constant temperature (30° C.) produced symptoms more rapidly (in 6 to 14 days) than a lower temperature (18°, 14 to 23 days) and increased the severity of shoot die-back and mottle symptoms. Low temperature increased the severity of necrotic spotting. Inoculations at bud-break caused more severe symptoms earlier than comparable autumn inoculations.

Eighteen winter-hardy hybrid *Prunus* varieties having a wide range in specific parentage were susceptible to latent necrotic ring spot though the symptoms were indistinct. Little natural infection was found in Minnesota nurseries and that present had a variety-nursery association. Surveys of random wild *Prunus* in the State revealed only about 4·5 per cent. with virus, indicating that little natural transmission takes place. Therefore, necrotic ring spot may be readily controlled in the nursery by propagating from mother trees known to be free from the virus.

Foster (H. H.) & Petersen (C. H.). **Xanthomonas pruni in summer cankers on Peach in South Carolina.**—*Plant Dis. Reptr*, 38, 11, pp. 783–785, 3 figs., 1954. [Multilithed.]

Xanthomonas pruni was isolated from overwintered 'summer cankers' on Jerseyland peach shoots [*R.A.M.*, 13, p. 172; 32, p. 490] in South Carolina. In the greenhouse, macroscopic symptoms of bacterial spot developed on peach leaves within six days of inoculation with isolates from both the overwintered summer and the spring cankers, indicating that the former may, under certain conditions, be important in initiating infection of spring foliage.

McKeen (W. E.). **A study of cane and crown galls on Vancouver Island and a comparison of the causal organisms.**—*Phytopathology*, 44, 11, pp. 651–655, 12 figs., 1954.

Crown and cane galls (*Agrobacterium* [*Bacterium*] *tumefaciens* and *A.* [*Bact.*] *rubi*) [*R.A.M.*, 34, p. 138] are reported to be so prevalent on Vancouver Island, Canada, that every boysenberry and Himalaya blackberry [*Rubus procerus*] in some plantations is infected. *Bact. rubi* is systemic in its hosts, usually inducing the formation of galls at the nodes; in other cases elongated ridges of white tumorous tissue appear at the internodes. Virulent gall-producing bacteria have been isolated from apparently healthy portions of floral canes. Galls have never been observed to develop spontaneously on primo canes but they appear soon after inoculation.

The eight gall-producing isolates studied (with the addition of a ninth in some experiments) were divided into six strains on the basis of their physiological reactions, host range, and nutritional requirements. Isolates 2 and 4, both from Himalaya blackberry, were quite distinct from the others. All but two of the isolates (2 and 9, the latter from boysenberry) produced galls on tomato, while 4 and 5 (red raspberry) were also pathogenic to sunflower, salmonberry [*Rubus spectabilis*], sugar beet, sweet and garden peas, eggplant, bean [*Phaseolus vulgaris*], and [chilli] pepper. Broad bean was attacked by all the isolates except No. 1, originating with A. J. Riker. The maximum growth temperature of isolates 2, 4, and 5 was 32° C., that of 7 (loganberry) 34°, and of 1, 3 (chrysanthemum), 6 (*Achillea ptarmica*), and 8 (*Euonymus*) [30, p. 272] 40°. The thermal death point of 4 and 5 was 48° to 49°, of 8, 50° to 51°, of 1, 2, 3, and 6, 51° to 52°, and of 7, 52° to 53°. The physiological reactions of the isolates varied widely and the separation of the two species cannot be readily effected. All the strains were attenuated in glycine media (*J. Bact.*, 63, pp. 715–722, 1952).

Jørstad (I.). **Host specialization within Norwegian Blackberry rusts.**—Reprinted from *Blyttia*, 11, 15 pp., 4 figs., 1953. [Norwegian summary.]

In an examination of the Norwegian material of *Rubus* subgenus *Eubatus* (blackberry) in the herbarium of Oslo University, four rust species were found to occur on this host group. *Phragmidium bulbosum* was found exclusively on *R. corylifolius*; *P. candicantium* only on *R. thyrsanthus*; *P. violaceum* on *R. lindebergii*, *R. radula*, and *R. selmeri* [cf. *R.A.M.*, 3, p. 428]; and *Kuehneola uredinis* commonly on *R. lindbergii*, *R. plicatus*, and *R. selmeri* [cf. 29, p. 469]. The presence of these rusts on *Eubatus* material simplifies identification of species of the latter since the rusts have a specialized host range.

Saponaro (Anna). **Presenza di Gloeosporium olivarum Alm. sugli organi vegetativi dall'Olivo nel Leccese e nel Brindisino.** [The presence of *Gloeosporium olivarum* Alm. on the vegetative organs of the Olive tree in the Provinces of Lecce and Brindisi.]—*Ann. Sper. agr.*, N.S., 7, 2, pp. 609–619, 5 figs., 1 graph, 1 map, 1953. [English summary.]

For some years past, olive trees growing in the Provinces of Lecce and Brindisi, Italy, have been affected by a form of blight which has grown progressively worse. The fruits drop from affected trees, the crown wilts, and the leaves are shed. *Gloeosporium olivarum* [*R.A.M.*, 33, p. 739 and next abstract] was found on infected fruits, fruit stalks, twigs, and leaves. The attack on the vegetative organs appears to have been favoured by unsuitable environmental and soil conditions. Control is recommended by improved cultural practices, while in areas of initial infection the trees should be sprayed with 1 per cent. Bordeaux. [This paper also appears in *Boll. Staz. Pat. veg. Roma*, Ser. 3, 11 (*1953*), pp. 61–71, 1954.]

CICCARONE (A.). **Acervuli 'stellati' in Gloeosporium olivarum Alm.** ['Stellate' acervuli in *Gloeosporium olivarum* Alm.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 11 (*1953*), pp. 57–60, 1 pl., 1954. [English summary.]

Artificial inoculations of olive fruits (subsequently transferred to different environmental conditions) with a monoconidial culture of a strain of *Gloeosporium olivarum* [see preceding abstract] which had previously given rise to both the usual 'cushion-like' pustules and acervuli surrounded by radiating synnemata indicated that formation of the latter was induced by mechanical resistance of the skin and environmental conditions (low temperature and humidity) unfavourable to vigorous development of the fungus.

BINGHAM (F. T.) & ZENTMYER (G. A.). **Relation of hydrogen-ion concentration of nutrient solution to Phytophthora root rot of Avocado seedlings.**—*Phytopathology*, 44, 11, pp. 611–614, 3 figs., 1 diag., 1954.

At the Citrus Experiment Station, Riverside, California, Mexican avocado seedlings of the Topa Topa variety were grown in solution cultures containing nitrogen as either ammonium or nitrate and adjusted to hydrogen-ion concentrations ranging from pH 3 to 8. *Phytophthora cinnamomi* [*R.A.M.*, 33, p. 738] was introduced into the cultures and the development of the resultant root rot observed.

Infection occurred throughout the range from 3·5 to 8 but not at 3, and as the reaction of the cultures was reduced from 6 to 3·5 the time in which the host roots collapsed increased correspondingly from between three and four to 21 days. At pH 8, too, the rot developed rather more slowly than at 6.

The form in which nitrogen was supplied to the plants did not influence the rate of root rot development at a given pH level.

MAGEE (C. J.). **Some aspects of the bunchy top disease of Banana and other Musa spp.**—*Proc. roy. Soc. N.S.W.*, 87, pp. 3–18, 6 pl., 1953.

In his Presidential address to the Royal Society of New South Wales in April, 1953, the author discussed the early history, geographical distribution, and symptom expression in various *Musa* spp. of the banana bunchy top virus [C.M.I. map No. 19]. One of the most useful symptoms for the early diagnosis of the disease is the occurrence of prominent dark green streaks [*R.A.M.*, 19, p. 610] in the petioles and along the leaf veins of many edible banana varieties, and in some seed-bearing *Musa* spp.; they are, however, rare in abaca (*M. textilis*). Observations in the field on abaca bunchy top [34, p. 138] in North Borneo showed that many varieties are tolerant of chronic infection, giving the impression of recovery from the disease.

There is still some doubt about the identity of the abaca and banana bunchy top viruses [29, p. 316], but field experience and transmission experiments with the vector, *Pentalonia nigronervosa*, have led the author to the conclusion that they are identical [27, p. 22]. Further similarities between the two diseases were observed in a comparison of phloem malformations in abaca from the Philippines and from Australia.

The address is concluded by suggestions for further lines of study in the problem of banana bunchy top, particularly symptomless chronic infection.

TOLLENAAR (D.). **The control of Sigatoka (Banana leaf spot disease) by mist-blowing with banacobre-Sandoz.**—*Netherlands J. agric. Sci.*, 3, 1, pp. 70–83, 5 figs., 1 graph, 1 map, 1955.

Since its first appearance in 1952 on Hacienda Clementina, province of Esmeralda, Ecuador, the spread and intensification of banana leaf spot [*Mycosphaerella musicola*: C.M.I. map No. 7] have been watched. Wind-borne ascospores carried infection to new areas, mainly adjoining roadsides and open spaces, at the opening

of the wet season, during the second part of which the foci already established were increased through the agency of water-borne conidia. No fresh infections developed during the dry season in the absence of periods with at least 18 hours of 100 per cent. atmospheric humidity after continuous rain, which are requisite for ascospore germination at 62° to 85° F. About two years after the first outbreak of leaf spot the affected plantations ceased to produce exportable fruit.

Fungicidal control of *M. musicola* depends on arresting the production and reducing the viability of the conidia arising from the spots on older leaves [*R.A.M.*, 26, p. 250], and its efficiency is enhanced, therefore, by even distribution and adequate tenacity of an active, finely dispersed product. To achieve these objects a mist-blower was constructed with a pipe 8½ ft. high, from the top of which a fine mist of banacobre-Sandoz, a cuprous oxide, with droplets 50 to 100 μ in diameter and containing a special waxy sticker, was blown on to the upper leaf surfaces of one or two rows of bananas on either side, using 100 l. per ha. at regular three- to four-weekly intervals. The results were highly satisfactory, and in fact the degree of protection obtained went beyond practical needs, so that a further reduction in expenditure (already only a quarter of that involved in high-volume Bordeaux spraying) might be effected by extending the interval between treatments to a month. A further advantage of the method is that it obviates the necessity of washing the fruits.

Jordović (M. M.). **Neka iskustva pri radu sa voćarskim motornim prskalicama.** [Some experiences in working with orchard motor sprayers.]—*Zasht. Bilja [Plant Prot., Beograd]*, *1954*, 23, pp. 80–85, 3 figs., 1954. [English summary.]

In tests with the motor sprayers used in orchards in western Serbia, Yugoslavia, 'Titan 430' proved the most effective, spraying 100 per cent. more trees than 'Arborex 1488' and 400 per cent. more than 'Hypermicrover 438', but expenses were 50 per cent. heavier. 'Arborex 1488' is regarded as the best suited for this region.

De Jong (P.). **Care and maintenance of crop protection equipment.**—*Plant. Chron.*, 48, 3, pp. 67–68, 1953.

Instructions are given for proper care and maintenance of the costly spraying and dusting equipment [cf. *R.A.M.*, 33, p. 101] used for crop protection on farms in India. Attention is particularly drawn to the intrinsic dangers, often ignored, of compressed air sprayers, the careless or improper use of which often results in casualties. A simple method is recommended for testing the correct working pressure of the containers at regular monthly intervals.

Maan (W. J.). **Plantenziektenbestrijding met vliegtuigen.** [Plant disease control with aircraft.]—*Landbouwvoorlichting*, 11, 6, pp. 292–298, 1 fig., 5 diags., 1954.

This is a survey of the technical and scientific developments in plant disease control by spraying from aircraft which have been made in Holland since the publication of the writer's previous article on the subject in 1951 [*R.A.M.*, 31, p. 393]. At present nearly all important diseases can be effectively combated in this manner, largely owing to the experiments of Fransen and Kerssen in connexion with *Phytophthora* [*infestans*] on potatoes [34, p. 162].

Ashworth (de B.). **Developments in and formulation of chemicals in crop protection.**—*Chem. & Drugg.*, *1953*, pp. 162–166, 5 figs., 1953.

This article is concerned with the practical considerations entailed in the selection and use of suitable chemical products for crop protection. The fungicides referred to are lime-sulphur; SR 406 [captan: *R.A.M.*, 31, p. 443], introduced

from the United States and given field trials in Great Britain in 1952; phenyl mercury acetate and chloride, for use as alternatives to lime-sulphur in spraying sulphur-shy fruit varieties; organo-mercury and non-mercurial dry seed dressings, chiefly for cereals; and copper sprays and dusts, mainly for the control of blight on potatoes and tomatoes [*Phytophthora infestans*].

Reavill (Mary J.). **Effect of certain chloronitrobenzenes on germination, growth and sporulation of some fungi.**—*Ann. appl. Biol.*, 41, 3, pp. 448–460, 1 fig., 3 graphs, 1954.

In investigations conducted at the Imperial College of Science and Technology, London, agar-coated slides inoculated with spores were placed in closed tins (10× 10×4 in.) and exposed to the vapour from a film of crystals (0·3 gm.) of tetrachloronitrobenzene (TCNB) [*R.A.M.*, 33, p. 413], prepared by evaporating to dryness 10 ml. of a 3 per cent. solution in acetone in the lid of a Petri dish 8·5 cm. in diameter. When the slide was enclosed in a Petri dish a film of 0·1 gm. was used.

When spores of *Botrytis cinerea* were exposed to TCNB deposited as a film and to an equivalent amount of commercial fusarex (3 per cent. TCNB), germination after 10 hours was 80 and 71 per cent., respectively, while germ-tube length measured by eye in terms of average spore length (average of 500 spores), was 3 and 2 respectively, as compared with 10+ in the controls.

Similar experiments with spores of *Trichoderma viride* gave similar results, though this fungus was less sensitive to TCNB than *B. cinerea*. The linear growth of agar colonies of *Pythium debaryanum* was unaffected by TCNB; *Phytophthora parasitica*, *Rhizoctonia* [*Corticium*] *solani* [32, p. 534], *T. viride*, and a strain (I) of *Fusarium caeruleum* isolated from potato at Sutton Bonington, which had been in culture for two years, were definitely retarded; a second strain (II) of *F. caeruleum*, freshly isolated from potato at Harlington, Middlesex, was more strongly retarded, though less so than *B. cinerea*. The treated cultures of *T. viride* developed a skin-like, often zoned, growth; sporulation was suppressed in *B. cinerea*, and greatly reduced in *F. caeruleum* and *T. viride*; sclerotium formation by *C. solani* was also reduced. Repression of linear growth was largely independent of the state of development of the colony at the time of applying the TCNB.

The increases in diameter of *B. cinerea* colonies after vapour treatment with TCNB for 3, 6, 12, and 24 days were 4·3, 4·7–, 4·5, and 4·3 [cm.], respectively, as against 5·2 for the untreated; between the third and sixth day after removal all the cultures made equal growth. Similar results were obtained with *F. caeruleum* and *C. solani*. Other experiments demonstrated that the repressive effect of TCNB on fungal growth accords with the general rule of increasing with decreasing growth potential, i.e., increasing at a low temperature or on a weak medium. Repression is also increased by acidity of the culture medium.

The effect of TCNB on sporulation was purely fungistatic. With sensitive fungi TCNB was more effective in repressing growth and sporulation than PCNB (pentachloronitrobenzene), though with *T. viride* the converse applied.

Walker (Alma T.). **Some effects of organic fungicides on the germination and respiration of Myrothecium verrucaria.**—*Iowa St. Coll. J. Sci.*, 27, 2, pp. 271–272, 1953.

The inhibitory effects of certain toxicants including *p*-benzoquinone, 2,3-dichloro-1, 4-naphthoquinone, tetrachloro-*p*-benzoquinone, ethyl mercury chloride, pentachlorophenol, 2,4-dinitrophenol, tetramethylthiuram disulphide [thiram], disodium ethylenebisdithiocarbamate [nabam], and actidione [*R.A.M.*, 32, p. 204] on spore germination and spore and mycelial respiration in *Myrothecium verrucaria* [loc. cit.] were compared by means of LD50 and the slope values from dosage-response curves.

Their toxicity in slide-germination tests ranged from 1·8 to 87 p.p.m., excluding 2,3-dichloro-1,4-naphthoquinone and tetrachloro-*p*-benzoquinone. The order of toxicity in the germination tests was the same as in spore respiration tests except for actidione. In general, the LD50 values for spore respiration were higher and the slopes lower than for germination. The dosage-response curves for inhibition of mycelial respiration were similar to those for spores. The LD50 values for mycelial respiration were higher than for spores except for the two phenols.

Hasselstrom (T.), Dateo (G. P.), Levinson (H. S.), Stahl (W. H.), Hewitt (E. J.), & Konigsbacher (K. S.). **Antioxidant activity and antagonism to microbial growth by piperine, isonicotinyl hydrazide and related compounds.**—*Food Res.*, **19**, 4, pp. 373–376, 1954.

The results of experiments reported in this joint contribution from the Pioneering Research Laboratories, U.S. Army Quartermaster Corps, Philadelphia, and the Evans Research and Development Corporation, New York, demonstrated a powerful fungistatic action of black pepper (*Piper nigrum*) spice, pepper oleoresin, piperine, apopiperine, β-cinnamenyl acryloyl hydrazide, β-cinnamenyl acryloyl piperide, and isonicotinyl hydrazide on *Aspergillus versicolor* at concentrations of 0·1 per cent. At 0·01 per cent. the growth of the mould was appreciably retarded, especially by β-cinnamenyl acryloyl hydrazide and β-cinnamenyl acryloyl piperide.

Suzuki (T.). **Studies on the relation between the physico-chemical characters and the effectiveness of agricultural chemicals.**—*Bull. nat. Inst. agric. Sci.*, Ser. C, **3**, pp. 57–136, 6 pl. 1953. [Japanese, with English summary.]

The results of experiments carried out between 1947 and 1951 at the National Institute of Agricultural Sciences, Japan, to discover the relation between the physico-chemical properties of agricultural chemicals and their effectiveness in controlling crop pests and diseases are summarized in this report. The work is divided into two sections, one covering spray liquids and the other dusts, although the wetting of leaves and the diffusion of moist dusts are included in both. It has been proved that the theory of the stability of hydrophobic colloidal systems is applicable to suspensions of wettable dusts. A diagram expressing the relation between the components of the spray liquid and the emulsification was constructed from a 3-phase system of spray liquid concentrate and spray liquid. Spreading and wetting are two different phenomena expressed by: spreading $S = \sigma (\cos \theta_a - 1)$, wetting $W = \sigma (1 + \cos \theta_r)$, where σ = surface tension, θ_a = advancing contact angle, θ_r = receding contact angle. Thus when both S and W are high, the mixture is a good spreader and a good wetter. If W is greater than S, it is a good wetter but not a good spreader, and when S and W are both low neither spreading nor wetting is good. S cannot be larger than W since $\theta_a > \theta_r$. By measuring $\sigma \cos \theta$ of the leaf surfaces of (1) potato, (2) grape vine and maize, and (3) rice, three types of wetting could be delineated. The conception of adhesion as expressed by quantitative sticking could be better calculated in terms of S and W, using a model constructed from sloping surfaces of known angle.

The tenacity of spray liquids [*R.A.M.*, 34, p. 235] is an unsolved problem theoretically. Experimental results showed that improving the dispersability of sprays reduced the amount of deposition, but increased the uniformity of distribution. The author measured the cohesive power of sprays and obtained an expression for cohesion-density-distribution. A diagram demonstrating the wash-off from different surfaces by varying intensities of rainfall is included.

In testing copper dusts on *Ophiobolus miyabeanus* on rice [32, p. 505] it was found that there was no relation between the physical composition of the dust and its efficacy, which was controlled by the copper ion content. After applying a copper dust by means of a 2·5 h.p. duster to citrus, significant differences in

deposits on different parts of the same tree were found. The properties of dusts, the method of dusting, climatic conditions, type of crop, and topographical features all affect the degree of control obtainable.

Novaković (V.). **Razvoj službe za zaštitu bilja u Bosni i Hercegovini.** [The development of the plant protection service in Bosnia and Herzegovina.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1954*, 23, pp. 95–98, 1954. [German summary.]

The history of the development of the plant protection service in Bosnia and Herzegovina, Yugoslavia [cf. next abstract], is briefly described.

Mijušković (M.). **Organizacija službe za zaštitu bilja u NR Crnoj Gori i njena aktivnost u toku zimskog perioda 1953/54 godine.** [The organization of the plant protection service in the P.R. of Montenegro and its activity during the winter period 1953–4.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1954*, 23, pp. 99–100, 1954.

The position of the plant protection service in Montenegro, Yugoslavia [cf. preceding abstract], is discussed and the need for further expansion is emphasized.

Zobrist (L.). **Utilisation de l'éthylène bisdithiocarbamate de zinc ou zinèbe dans le domaine de la défense des cultures en Suisse.** [The use of zinc ethylene bisdithiocarbamate or zineb in the realm of plant protection in Switzerland.]—*Phytiatrie-Phytopharm., 1953*, 1, pp. 21–28, 4 pl., 1953.

Experiments begun in Switzerland in 1948 have revealed the wide range of plant diseases against which zineb is effective [cf. *R.A.M.*, 30, p. 52], including apple and pear scab (*Endostigme* [*Venturia*] *inaequalis* and *E.* [*V.*] *pirina*) [29, p. 290], rust of *Prunus* spp. (*Tranzschelia* [*Puccinia*] *pruni-spinosae*), various soil fungi, cabbage downy mildew (*Peronospora brassicae*) [*P. parasitica*], potato blight (*Phytophthora infestans*) [32, p. 275], vine downy mildew (*Plasmopara viticola*), and *Mycogone perniciosa*, often accompanied by *Verticillium*, on mushrooms [32, p. 299].

Aitkenhead (P.) & Tomlinson (J. A.). **Diseases and pests on horticultural planting material. A guide to their recognition.**—iv+38 pp., 83 pl., London, H.M. Stationery Office, 1953. 6*s*.

This is a guide to the detection of the more common pests and diseases on horticultural plants commonly imported and exported as planting material, arranged alphabetically under the common English name of the host plant. Many of the diseases are illustrated by excellent photographs.

Doidge (E[thel] M.), Bottomley (A[veril] M.), Van der Plank (J. E.), & Pauer (G. D.). **A revised list of plant diseases occurring in South Africa.**—*Sci. Bull. Dep. Agric. S. Afr.* 346, 122 pp., 1953.

This is the third list of South African plant diseases [cf. *R.A.M.*, 10, p. 679] but, as the authors state, it is incomplete, fungus diseases having received closer study than those caused by bacteria or viruses. The diseases are listed under the common name of each host with Latin name appended, and notes are given regarding their prevalence, distribution, importance, and varietal resistance.

Kominami (K.). **A general catalogue of the cultures of micro-organisms maintained in the Japanese collections.**—Higher Education and Science Bureau, Ministry of Education, Tokyo, [6+] 186+8+3 pp., 1953.

This catalogue lists about 22,000 fungi and bacteria, maintained in the culture collections [cf. *R.A.M.*, 32, p. 636] of 144 organizations in Japan. The cultures are recorded in alphabetical order, with synonyms and common names, the place where kept, culture number, origin, and name of the isolator.

Directory of collections of micro-organisms and list of species maintained in India. —iii+43 pp., Council of Scientific and Industrial Research, New Delhi. 1953. 1 rupee.

Cultures of algae, fungi, bacteria, and viruses maintained in 74 institutions in India are listed here, together with the names of the organisms arranged alphabetically under genera in each group, with numbers after each, signifying from which collections they may be obtained. Some 190 genera of fungi, 18 of yeasts, five potato viruses, and five species of *Pseudomonas* and four of *Xanthomonas* are represented in culture collections.

Rosa (M.). **Contributo ad una bibliografia fitopatologica italiana per l'anno 1953.** [A contribution to an Italian phytopathological bibliography for the year 1953.] —*Boll. Staz. Pat. veg. Roma*, Ser. 3, 11 (*1953*), pp. 295–306, 1954.

A list, arranged in alphabetical order of authors' names, is presented of phytopathological contributions which appeared in Italian journals during 1953.

Godfrey (R. M.). **Germination of chlamydospores in the Endogonaceae.**—*Nature, Lond.*, 175, 4454, pp. 468–469, 1 fig., 1955.

In the Department of Botany, University of Bristol, chlamydospores of both *Endogone macrocarpa* and *E. microcarpa* were germinated on plain agar. With the former some germinated immediately and others only after several months' storage in soil. Those of *E. microcarpa*, collected at the same time, in the autumn of 1953, first germinated when plated out the following spring. All those germinating, however, formed only a small proportion of the spores in relatively few of the fruit bodies collected. In both species the new hypha emerges from the stump of the old one on which the spore was produced and grows slowly, occasionally producing branches which may anastomose with nearby hyphae.

Shaw (Dorothy E.). **Cytology of Septoria and Selenophoma spores.**—*Proc. Linn. Soc. N.S.W.*, 78, 3–4, pp. 122–130, 1 pl., 1 fig., 1953. [Received March, 1955.]

In an investigation at the University of Sydney of the nuclear condition of the spores of the genera *Septoria*, *Selenophoma*, *Ascochyta*, *Colletotrichum*, *Fusarium*, *Gloeosporium*, and *Phyllosticta*, using the Giemsa and other stains, one nucleus per cell was found. One linear nucleus was demonstrated in the pycnidiospores of *Septoria tritici*. In many of the species studied the nuclei in the germ-tubes and hyphae were elongated, but those in hyphae and conidia of *Neurospora tetrasperma* were rounded. The immature, unicellular spores of *S. nodorum* contained five to seven nuclear fragments.

Fat tests revealed differences between the two types of *Septoria* spore as they occur in the field. Spores of *Selenophoma* gave a reaction similar to the filiform *Septoria* type; an *Ascochyta* sp. reacted like the cylindrical type.

Nicholas (D. J. D.). **Chemical tissue tests for determining the mineral status of plants in the field.**—33 pp., 4 figs., Salisbury, The Tintometer Ltd., 1953. 8*s.* 6*d.*

The tests described in this booklet were developed at Long Ashton Research Station for the field diagnosis of mineral disorders in plants [*R.A.M.*, 28, p. 508]. A foreword to the booklet contains a note on the portable apparatus required for the tests. Mineral nutrients extracted from fresh plant tissues are estimated quantitatively by colorimetric or turbidimetric comparisons in a Lovibond comparator. Tests for nitrate nitrogen, phosphate, potassium, chloride, magnesium, calcium, manganese, aluminium, copper, zinc, lead, iron, and nickel are described and tabulated. The bibliography comprises 20 references.

Burcik (E.) & Plankenhorn (Brigitte). **Darstellung von Bakteriengeißeln mittels Phasenkontrast.** [Demonstration of bacterial flagella by means of phase contrast.]—*Arch. Mikrobiol.*, 19, 4, pp. 435–437, 1 fig., 1953. [Received February, 1955.]

None of the 16 methods for the staining of bacterial flagella tested at the Botanical Institute of the Agricultural College, Hohenheim, Germany, having proved satisfactory, a procedure was devised involving the fixing of smears with 2 per cent. osmic acid for 30 seconds, the application of Zettnow's antimony-tannin reagent, and subsequent examination under the phase contrast microscope in air or water.

Stahl (W. H.) & Pessen (H.). **The microbiological degradation of plasticizers. I. Growth on esters and alcohols.**—*Appl. Microbiol.*, 1, 1. pp. 30–35, 4 graphs, 1952.

It has been shown that localized stiffening of thin plastic films, formed from vinyl resins made pliable by the addition of a high molecular weight ester, is due to the plasticizer being attacked by fungi or bacteria (Molmar (D. M.) & Leonard (J. M.). Tropical deterioration of materials for electrical equipment. Naval Research Laboratory Report P-2492, 1945). *Aspergillus versicolor* and *Pseudomonas aeruginosa* have been frequently isolated from degraded plastic films (Harvey (J. V.) & Meloro (F. J.). Studies on degradation of plastic films by fungi and bacteria. Quartermaster Laboratory Report, Microbiological Series no. 16, 1949). These two organisms were tested in the Pioneering Research Laboratories, U.S. Army Quartermaster Corps, Philadelphia, on a variety of substrata, including an homologous series of dialkyl sebacates, a selection of commercial plasticizers and their constituent alcohols, with varying growth reactions.

Laboratory-prepared, pure plasticizers supported better growth, especially of *A. versicolor*, than commercial products. *P. aeruginosa* grew best on esters with C_7 to C_{18} alkyl groups, and on alcohols with a chain of C_8 upwards. *A. versicolor*, however, grew most readily on the esters with C_3 to C_{10} alkyl groups, the alcohols from C_{12} onwards, and on all the fatty oil plasticizers. Side-chains decreased the growth of the fungus but had no effect on the bacterium.

It is concluded that any structural modifications of the organic plasticizers which make it fungus proof will not necessarily confer protection from bacteria.

Zoberst (W.). **Die Bedeutung der Pilze für die chemisch-pharmazeutische Industrie.** [The importance of fungi in the chemico-pharmaceutical industry.]—*Z. Pilzk., 1955*, 18, pp. 6–15, 1955.

A systematic survey is given of fungal products useful to the chemico-pharmaceutical industry [cf. *R.A.M.*, 33, p. 617], i.e., the metabolites obtained from fungi and bacteria through biosynthesis, including antibiotics, organic acids, vitamins, solvents, fats, proteins, and enzymes. Organic acids are listed together with the fungi producing them and the relevant references; the fundamental microbiological, biochemical, and technological features of biosynthesis are discussed. A special review is given of the production of antibiotics, vitamins, and organic acids in the United States.

Tatsumi (C.) & Miyaura (J.). **An antibiotic from actinomycetes. I. Isolation of strains active against plant pathogenic microbes and antibiotics from Streptomyces A-6 strain. II. Effectiveness of some antibiotics against Erwinia carotovora.**—*J. Ferment. Technol.*, 32, pp. 1–7, 364–366, 1954. [Abs. in *Chem. Abstr.*, 49, 3, p. 2007, 1955.]

At Naniwa University, Sakai, Osaka, Japan, A-6 (*Streptomyces fradiae*) [*R.A.M.*,

30, p. 58] was shown by the spray, agar streak, and pulp and agar disk methods to be the most potent antibiotic producer of 27 strains of actinomycetes isolated from soil. Meat extract with 2 per cent. yeast was a better source of nitrogen than peptone; when the latter was used starch provided more carbon than glycerol or glucose. The antibiotic substance, stable at pH 5, was first produced in shake cultures. Applied at a concentration of 3·2 γ before sowing Chinese cabbage, it prevented the development of soft rot (*Erwinia carotovora*) but later treatments were ineffectual against the pathogen.

In a bouillon-agar medium *E. carotovora* was inhibited by streptomycin, chloramphenicol, chlorotetracycline, hydroxytetracycline, penicillin G, and the A-6 product at concentrations of 6·4, 2·4, 2·7, 5, 1·3, and 0·6 γ per ml., respectively. A-6 gave the best control of soft rot in radish, carrot, Chinese cabbage, and onion [34, p. 335], followed by chloramphenicol, chlorotetracyline, and hydroxytetracycline. None of the antibiotics was phytotoxic to growing radishes at concentrations below 500 γ per ml.

CARVAJAL (F.). **Host-parasite relations with a polyvalent streptomycophage from Streptomyces griseus.**—*Antibiot. & Chemother.*, 5, 1, pp. 28–37, 4 figs., 1955.

At the Schenley Laboratories, Inc., Lawrenceburg, Indiana, the polyvalent *Streptomyces griseus* phage No. 1, was shown to be active against certain strains of eight *S.* spp., including two plant pathogens, *S.* [*Actinomyces*] *scabies* and *S.* [*A.*] *ipomoea* [*R.A.M.*, 28, p. 539], which attack potato and sweet potato, respectively. Not only does the phage grow and multiply at 37·5° C., but it may assume greater virulence at this temperature than at 28°, e.g., when grown with *S. griseolus* or *S. viridis*. A definite zone of mycophagy, within which the resistant colonies of of *S. griseus* appear as whitish pellets suspended in the viscous medium, can be developed at either temperature within one to five days in test tubes in the top portion of a substrate containing 0·05 to 0·1 per cent. agar. The phage requires an adequate supply of oxygen to exercise its activity against *S. griseus*, and its potency is also affected by humidity, the number of phage particles, amount and age of host cells, and the nature of the medium, in addition to the factors already mentioned.

TEN HOUTEN (J. G.). **Luchtverontreiniging door industriegassen en de nadelige gevolgen voor land- en tuinbouw.** [Air pollution by industrial gases and the detrimental consequences for agriculture and horticulture.]—*Meded. Dir. Tuinb.*, 16, pp. 675–688, 7 figs., 1953. [English summary. Received February, 1955.]

The rapid increase in industrialization following the second world war has been accompanied by air pollution from factory fumes [cf. *R.A.M.*, 33, p. 547] in some parts of Holland. Near Pernis, for instance, Conference and other pear varieties, plums, and Manx Codlin apples have sustained heavy damage, expressed in pears by irregular, black, marginal spotting of the leaves, culminating in complete necrosis and defoliation. Certain gladiolus varieties, e.g., Snow Princess, Hopmans Glory, and Tivoli, and irises are highly susceptible, while narcissi, tulips, red-hot pokers [*Kniphofia* spp.], and lilies are also affected. Other sensitive crops include green vegetables, shallots, and onions.

Some contributions to the literature are cited and an account is given of the author's observations on similar forms of injury in the United States. The symptoms induced by sulphuric acid, hydrogen fluoride, oxidized unsaturated carbons, and 2,4-D are described. Methods of investigation in current use are briefly discussed, including some for the determination of the chemical components of phytotoxic air pollutants.

Harrison (R. W.). **A method of isolating vesicular arbuscular endophytes from roots.**—*Nature, Lond.*, 175, 4453, p. 432, 1955.

Working in the Department of Botany, University of Bristol, the author has devised a direct method of isolating an endophyte (identified as *Pythium ultimum*) from roots of *Allium ursinum*. They are first washed thoroughly and then shaken vigorously in four changes of sterile water to remove the contaminant rhizosphere fungi. Longitudinal sections, cut aseptically, are transferred to a sterile cover-slip and covered with a few drops of plain agar containing 0·2 ml. aureomycin per 15 ml.; the cover-slip is sealed to a glass ring. When an intercellular hypha grows out from the cut edge it is transferred to plain or malt agar.

Perlman (D.). **Physiological studies on the Actinomycetes.**—*Bot. Rev.*, 19, 1, pp. 46–97, 1953.

This is a brief survey of papers of major interest on the physiology of the Actinomycetes published between 1940 and 1952. An alphabetically arranged list of 543 selected references is included.

Baumann (H.). **Zur Frage des Kartoffelabbaus in der Übergangslage.** [On the question of Potato degeneration in the transitional situation.]—*Dtsch. Landw.*, 5, 11, pp. 570–578, 1 graph, 2 maps, 1954.

The problem of potato degeneration is fully discussed in relation both to viruses and the ecological factors prevailing in central and other parts of Germany [cf. *R.A.M.*, 29, p. 226 and next abstract]. Notably in the 'transitional situations', i.e., those in which the conditions are intermediate between favourable and adverse, a great improvement in the health of the crop may be effected by correct cultural practices, with special attention to soil maintenance by regular applications of green and stable manures. Light to medium soils appear to have the least leaf roll. An experiment in early lifting (10 to 20 days after flowering) [loc. cit.] in 1953 gave promising results in the reduction of leaf roll, especially on heavy soil.

Wartenberg (H.). **Erfahrungen mit Spätpflanzungen (Sommerpflanzungen) und Frühernten (Krautziehen) zur Gewinnung gesunder Pflanzkartoffeln.** [Experiences with late plantings (summer plantings) and early harvests (haulm-pulling) for the production of healthy seed Potatoes.]—*Dtsch. Landw.*, 5, 11, pp. 578–581, 1954.

From his experience in the Naumburg–Jena district of Germany the author concludes that summer planting is an unsuitable method for potato virus disease control under central European conditions, and he definitely advises against it. Early lifting is a more hopeful approach to the problem [cf. preceding abstract], but it should not be delayed beyond the time of flowering or shortly thereafter.

Wetter (C.) & Brandes (J.). **Elektronenmikroskopische Untersuchungen über Gestalt und Grösse des Kartoffel-S-Virus.** [Electron-microscopic studies on the shape and size of Potato virus S.]—*Naturwissenschaften*, 42, 4, pp. 100–101, 1 fig., 1 graph, 1955.

In an electron-microscopic study at the Biological Institute, Brunswick, on the frequency distribution of particle length values of potato virus S [*R.A.M.*, 34, p. 245] from exudates of five Erdgold plants, a definite climax occurred between 625 and 675 mμ, with a further peak between 1,250 and 1,350 mμ. Similar results were obtained with material from Fortuna, Heida, Ackersegen, Industrie, and *Solanum demissum*. In the case of Erstling [Duke of York], a symptomless carrier of both X and S viruses, the particles of the latter were more rigid and larger than those of the former. The virus isolated by Köhler from the D1102 potato selection

agrees with virus S in morphology and reacts positively to anti-S serum, while both induce symptoms on *Gomphrena globosa* leaves.

ROLAND (G.). **Sur un essai de lutte contre les pucerons en vue de limiter la propagation des virus attaquant la Pomme de terre.** [On an attempt at the control of aphids with a view to limiting the propagation of viruses attacking the Potato.]—*Parasitica*, 9, 1, pp. 6–10, 1953.

In an experiment carried out at the State Phytopathological Station, Gembloux, Belgium, to test the value of 0·01 per cent. parathion sprays containing 50 per cent. of the active material in controlling the aphid vectors of potato viruses Y and X and leaf roll, the progeny of treated plots showed 82, 77, and 7 per cent. infection, compared with 50, 40, and 12 per cent. respectively, from the untreated. These results clearly demonstrated that repeated spraying with parathion did not improve the sanitary condition of the tubers harvested. On the contrary, parathion appears to have attracted the aphids, an effect also reported for potato variety E 605 in Germany [*R.A.M.*, 31, p. 348].

NATTI (J. J.), KIRKPATRICK (H. C.), & ROSS (A. F.). **Host range of Potato leafroll virus.**—*Amer. Potato J.*, 30, 3, pp. 55–64, 1953.

At the Department of Plant Pathology, Cornell University, New York, the susceptibility to potato leaf roll virus of over 150 species in 39 families was investigated by means of inoculations made with *Myzus persicae*. Attempted recovery of the virus was made by feeding aphids for five to six days on the test plants and then transferring them to indicator plants, i.e., *Physalis floridana*, *P. angulata*, or *Datura stramonium*. The species considered to be susceptible were those from which the virus was recovered three to six weeks after inoculation.

Nine species of Amaranthaceae were tested, and all were graded susceptible: *Amaranthus caudatus*, *A. graecizans*, *A. retroflexus*, *Celosia argentea* and its vars. *childsii*, *cristata*, *plumosa*, and *spicata*, and *Gomphrena globosa*. The only other susceptible non-solanaceous species was *Nolana lanceolata*. Of several solanaceous species tested, most were susceptible, but a few were not susceptible under the experimental conditions employed. Infected plants of the following solanaceous species were symptomless: *Atropa belladonna*, eggplant, *Lycopersicon pimpinellifolium*, *Nicotiana glutinosa*, *N. rustica*, *Physalis peruviana*, *Solanum citrullifolium*, *S. integrifolium*, and *S. nigrum*.

CORBETT (M. K.). **Hypersensitivity of Solanum tuberosum L. hybrids to Potato virus Y (Marmor upsilon Holmes).**—*Diss. Abstr.*, 14, 11, p. 1873, 1954.

Inbred potato lines were mechanically inoculated in the greenhouse at Cornell University [Ithaca, New York], with four strains of virus Y [*R.A.M.*, 32, p. 640]. The clones giving no reaction or producing local lesions only were planted in exposure plots in the field; almost all became systemically infected. When virus from some of these was introduced mechanically into healthy plants of a clone that had appeared hypersensitive in the original tests local lesions developed with no systemic infection. This reversal in reaction was attributed to differences in inoculation methods. Clones that appeared hypersensitive or non-reactors to mechanical inoculation became systemically infected when colonized in the greenhouse with aphids that had sought their own feeding sites. Systemic infection also resulted in these clones following grafting, the application of aphids to very young plants, or mechanical inoculation of very young plants or very young leaves of older plants. Aphid or mechanical inoculation of older leaves resulted in localized infection only. The application of indole acetic acid in lanolin to the petioles of inoculated leaves delayed leaf abscission but did not affect local lesion formation. Systemic infection occurred in these plants but not in comparable untreated ones.

From these results it appears that the clones studied are not truly hypersensitive and that localization following mechanical inoculation of older leaves is the result of slow movement from the site of inoculation coupled with abscission of inoculated leaves.

PETERSON (L. C.) & MILLS (W. R.). **Resistance of some American Potato varieties to the late blight of Potatoes.**—*Amer. Potato J.*, 30, 3, pp. 65–70, 1953.

After briefly tracing the history of the development in the United States of potato varieties resistant to or immune from the common form of blight (*Phytophthora infestans*) [*R.A.M.*, 27, p. 34 *et passim*], the author states that under normal field conditions *P. infestans*, apparently, does not exist as a composite of a large number of races. New races have, however, been found on resistant selections grown in plots adjacent to susceptible varieties, when conditions strongly favoured blight, and all varied from the common race (A) of *P. infestans* in pathogenicity. Races B, C, D, BC, and BD have been identified [33, p. 250].

A possible explanation of the sudden appearance of new races of *P. infestans* is that a change occurs in the pathogen and the resistant seedlings: for example, infection may take place after the plant has become senescent. The organism then established in the active lesions is invariably capable of causing infection on young, vigorously growing plants of the variety or seedling concerned. Thus, a new race of *P. infestans* is produced, able to infect a plant immune from race A. If the new form comes into contact with a resistant plant, then suitable conditions are provided for its multiplication without competition from race A. Races so produced under controlled conditions in the greenhouse are identical with the five new races isolated from field-grown plants.

All the recently introduced resistant varieties of potato are susceptible to races D and BD, though immune from the others. The tubers of some are reported as being resistant to race A, but susceptible to D and BD.

Though resistant varieties grown in Pennsylvania are regularly sprayed, the number of reports of blight in these varieties (including Essex) [29, p. 430] indicates that race D is generally prevalent in the state. Resistant varieties should always be sprayed in seed-growing areas, even if the new races of *P. infestans* have not been found there.

FERRIS (VIRGINIA R.) & LYON (H. H.). **The flagella of swarm-spores of Phytophthora infestans as viewed with the phase and electron microscopes.**—Abs. in *Phytopathology*, 44, 9, pp. 487–488, 1954.

Paddle-like structures on many of the flagella of living zoospores of *Phytophthora infestans* [*R.A.M.*, 33, p. 686 and next abstract] may be seen under the phase microscope. Further studies under the phase and electron microscopes demonstrated the presence of cilia on one of the flagella. The paddle-like structures do not begin to appear until the rapid movement of the zoospores immediately after emergence is replaced by slower swimming and result from inward rolling of the tip. Before germination takes place the zoospore ceases to move, and the flagella, still resembling paddles and sometimes completely rolled up, become detached and float away.

GRAHAM (K. M.). **Nuclear behaviour in Phytophthora infestans.**—Abs. in *Phytopathology*, 44, 9, p. 490, 1954.

The most satisfactory material for this study on the cytology of *Phytophthora infestans* [see preceding abstract] was that collected from its natural hosts at the inception of sporulation. Nuclei which were apparently about to divide or had already done so stained more readily by a modified Feulgen technique than those in the resting state. Vegetative hyphae and sporangia are multinucleate. Some

very young sporangia were uninucleate, while others contained as many as four nuclei, and in the larger ones the number was indefinite. Well-defined mitotic anaphase figures were sometimes discernible and clumps of chromosomes were also detected. The numerous zoospores observed were all uninucleate. It would appear that a single nucleus migrates into the sporangium at the time of its initiation, and that the zoospores of a given sporangium contain sister nuclei. Monozoospore or monosporangial cultures should therefore be genetically pure and suitable for the establishment of a pure culture of any given race [cf. *R.A.M.*, 32, p. 206].

KEAY (MARGARET A.). **Further observations on delayed sporulation of Phytophthora infestans on infected Potato shoots.**—*Plant Path.*, 3, 3, pp. 88–89, 1954.

In February, 1953, tuber samples of King Edward potatoes were inoculated with isolates of Black's strains A, B^1 (two isolates used), B^2, and C of *Phytophthora infestans* [*R.A.M.*, 33, p. 174]. On 27th March some of these tubers were planted in pots of sterilized compost in a glasshouse. Eight produced plants. Basal necrosis developed on three and *P. infestans* (strain A) was recovered from one (inoculated with that strain), which produced spores of the fungus at heights of 16 and 24 cm. on the stems.

Other inoculated tubers were kept from 27th March until 15th April at 8° C., and then at room temperature until 21st April. They were then potted up as before and transplanted to a cold frame on 13th May. On 5th June necrosis was apparent to a height of 7 cm. on a stem developed from a tuber inoculated with strain B^1. During the ensuing 12 days the necrosis spread a further distance of 1 cm. *P. infestans* developed on the necrotic tissues, but the strain was not identified.

On 24th June *P. infestans* was found to be sporing on the basal 4 cm. of a stem from a B^1 inoculated tuber and three days later sporulation was profuse to a height of 7 cm. The strain was identified as B^1. The other stems on this plant remained free from blight. The results are considered to provide strong evidence that the infection came from the tubers.

GRAY (ELIZABETH G.), CLOUSTON (D.), & BIGGAR (W. A.). **Potatoes : some seed production problems.**—*Bull. N. Scot. Coll. Agric.* 2, 20 pp., 9 figs., 1953. [Reprinted from *Trans. Highl. agric. Soc. Scot.*, 1952.]

The problems facing seed potato producers in Scotland are briefly outlined. It is advantageous to plant sprouted tubers, to avoid blanks due to diseases. The plants must be constantly under observation during the growing season, and diseased plants rogued according to the grade of certificate which is required.

It is emphasized that blight [*Phytophthora infestans*: cf. *R.A.M.*, 33, p. 251] is frequently observed in the north of Scotland earlier than in the south of England, the first recorded outbreaks in the ten years from 1943 to 1952 occurring between 26th June and 18th July.

The advantages of tuber treatment, different methods of haulm destruction [32, p. 395], and problems associated with methods of lifting, storing, and transporting the seed crop are discussed.

PANJAN (M.) & LUŠIN (V[ERA]). **Prilog ispitivanju patogeniteta gljivice Phytophthora infestans de By različite provenijense.** [Contribution to the study of pathogenicity of the fungus *Phytophthora infestans* de Bary from different sources.] –*Zasht. Bilja* [*Plant Prot., Beograd*], *1954*, 23, pp. 39–43, 1 graph, 1954. [French summary.]

At the Institute for Plant Protection, Zagreb, Yugoslavia, strains of *Phytophthora infestans* were tested each on a single Sebago potato tuber [*R.A.M.*, 31, p. 349] using the method of Lehmann-Köck [cf. loc. cit.; 17, p. 765]. Six degrees of viru-

lence, ranging from 0 (a necrotic reaction) to 5 (completely covered with mycelium), were distinguished. The strains Z and GK were grouped in class 0, S in 3–4, U in 4, and B and C in 5.

Schick (R.), Schick (E.), & Hank (H.). **Einige Bemerkungen zu einer internationalen Nomenklatur der Phytophthora-Rassen und der die Phytophthora-Widerstandsfähigkeit kontrollierenden Gene der Kartoffel.** [Some observations on an international nomenclature of the *Phytophthora* races and the Potato genes controlling resistance to *Phytophthora*.] –*Züchter*, 24. 9, pp. 249–252, 1 diag., 1954.

Between 1950 and 1953 ten distinct physiologic races of *Phytophthora infestans* were isolated at the Institute for Plant Breeding, Gross-Lüsewitz, Berlin, nine of which could be classified within the extended scheme for international nomenclature [*R.A.M.*, 33, p. 251] by the postulation of a new resistance gene R_0, corresponding to the resistance type of *Solanum demissum* Reddick 521 52.3 99 [cf. 12, p. 390], which is of very frequent occurrence in the material under investigation. The position of the tenth race, 00, from Sieglinde, which is of no practical importance, requires further clarification.

Uhlig (S.). **Methoden zur Vorhersage von Phytophthora Ausbrüchen (Übersicht über den gegenwärtigen Stand des Problems.)** [Methods for the prediction of *Phytophthora* outbreaks (survey of the present status of the problem).]—*Z. Acker- u. PflBau*, 98, 1, pp. 119–125, 1954.

Six of the ten contributions consulted by the author in his critical survey of the present position in respect of forecasting outbreaks of potato blight (*Phytophthora infestans*) have already been noticed [*R.A.M.*, 5, p. 627; 29, p. 529; 32, p. 585; 33, p. 499]. The method used in the Republic of Ireland, described by Bourke in *Tech. Note Dep. Indust. Comm. met. Serv.* 15, 1953, is based on the hourly reports of the official meteorological stations and predicts a critical period whenever (1) a temperature of or above 10° C. and a relative humidity of or exceeding 90 per cent. prevail for at least 12 hours in succession and (2) the leaf surfaces for at least four of the 12 hours are moistened with water. In the absence of rain or dew to wet the leaves the relative humidity must be maintained for at least 16 hours at or above 90 per cent. to justify the prediction of a critical period.

Adding up the mean daily temperatures from 1st April, Thran (Das Wetter in Schleswig-Holstein, VI, Nos. 49 and 51, Meteorologisches Amt, Schleswig, 1952) calculates that the zero dates for the Erstling [Duke of York] and Sieglinde varieties will be reached at totals of 800° and 1,100°, respectively. According to another set of criteria applied in the same province, a critical period exists when for two consecutive days the maximum temperature is above 23°, the minimum not below 10°, the mean daily vapour pressure over 12 mm., and the mean amount of cloud not below five-tenths. The incubation period (ibid., No. 67, 1952) ranges from two to three days with a mean temperature of 20° to over 13 at 12°.

Kabiersch states in *Gesunde Pflanzen*, 5, p. 20, 1953 that Post and Richel's rules [*R.A.M.*, 30, p. 537] have lately been applied at the Celle and Lüneburg meteorological stations for the main potato-growing zone of north Hanover. A number of critical periods before mid-July, however, did not result in outbreaks of blight within the specified time of 15 days.

It is concluded that, although agreement may be reached as regards the meteorological factors to be considered in the definition of critical periods for the whole of central Europe, the crucial threshold values will differ in every region. The broadly based co-operation of local weather bureaux in supplying dates of the first outbreaks is regarded as an urgent necessity.

GUILLEMAT (J.) & LELIÈVRE [D.]. **Étude de l'efficacité de quelques fongicides sur la vitalité des sclérotes du rhizoctone de la Pomme de terre.** [A study of the efficacy of some fungicides on the vitality of the sclerotia of *Rhizoctonia* of Potato.]—*Pomme d. Terre franç., 1953*, 161, pp. 16–24, 4 graphs, 1953.

Studies were made at the National School of Agriculture, Grignon, France, on the viability of sclerotia of *Rhizoctonia* [*Corticium*] *solani* on potato submitted to various fungicidal treatments [*R.A.M.*, 32, p. 504]. Of about 40 products tested by steeping tubers and detached sclerotia, commercial formalin (40 per cent. formaldehyde) gave constantly good results at a concentration of about 1 per cent. Potassium permanganate was consistently active at 4 per cent. The lethal dose for the organo-mercurials was about 0·06 to 0·25 per cent., for quaternary ammonium compounds 0·5 to 1·5 per cent., and for copper oxyquinolinolate 0·2 to 0·5 per cent. None of these products harmed plant growth provided that the tubers were not sprouting at the time of treatment.

Of substances tested as aerosols only pure 40 per cent. commercial formalin was effective at the test dosage (1 ml. per cu. m.), giving from 90 to 98 per cent. inhibition of germination of the sclerotia. All the aerosol materials were active at very low dosages, far below the phytotoxicity threshold. Tests in 1951 indicated that 50 ml. per cu. m. had no deleterious effect on plant growth or yield.

MCKEE (R. K.). **Dry-rot disease of the Potato. VIII. A study of the pathogenicity of Fusarium caeruleum (Lib.) Sacc. and Fusarium avenaceum (Fr.) Sacc.**—*Ann. appl. Biol.*, 41, 3, pp. 417–434, 4 figs., 2 graphs, 1954.

In further studies at the University of Nottingham School of Agriculture on potato dry rot [*R.A.M.*, 32, p. 502] inoculation of wounded tubers of the Doon Star and King Edward varieties at intervals throughout the storage season showed that, after harvesting, resistance to infection by *Fusarium avenaceum* persisted longer than resistance to *F. caeruleum*, though eventually the tubers became equally susceptible to both. Infection occurred less readily through clean-cut than through scarified wounds. Resistance to infection was greater when an interval elapsed between wounding and inoculation than when the wound was inoculated immediately. This was related to increased intrinsic ability of the cells near the wound to resist infection rather than to suberization of the wounded surface or to wound periderm formation.

F. caeruleum grew through the intercellular spaces, the adjacent host cells living on, sometimes for long periods; *F. avenaceum*, on the other hand, killed and penetrated the cells with which it came into contact. Restriction of incipient or established lesions of *F. caeruleum* and of incipient ones of *F. avenaceum* was associated with suberin deposition on the cell walls and in the intercellular spaces. In established lesions of *F. avenaceum* restriction appeared to be brought about by increased intrinsic resistance of the adjacent host cells.

F. caeruleum appears to possess greater ability than *F. avenaceum* to initiate infection in wounded tubers. The difference in the host-parasite relationships in the two diseases may be related to the relative efficiencies of the two fungi as tuber parasites. In spreading lesions *F. caeruleum* appeared to behave as a true parasite, whereas *F. avenaceum* developed saprophytically on the dead tissues of the penetrated cells, and in susceptible tubers advanced by killing and colonizing the tissues at the periphery of the lesion.

It was not possible to relate the increase in susceptibility noted during storage to any particular change in the properties of the host tissues, but it would appear that the tissues of newly harvested tubers are sensitive to infection, yet able to respond to it by necrosis and suberin deposition. As the tubers mature the reaction to infection diminishes, eventually disappearing. On the whole, early varieties are

more susceptible to dry rot than the maincrop ones, which indicates that the duration of resistance may be related to length of the initial rest period. Though the rates of suberization of wounds and of meristem development normally decrease as the tubers mature, there was little change in these rates during a period when susceptibility markedly increased; there was no great difference in the rates as between the relatively resistant King Edward and the susceptible Doon Star tubers.

HOUGHLAND (G. V. C.) & CASH (LILLIAN C.). **Effectiveness of certain soil fungicides in the control of Potato scab.**—*Plant Dis. Reptr*, 38, 11, pp. 777–780, 1 fig., 1954. [Multilithed.]

In field trials at Beltsville, Maryland, in 1954, furrow applications of 75 per cent. pentachloro nitrobenzene (PCNB), mixed with sand and then with the surface soil at planting time, reduced potato scab (*Streptomyces* [*Actinomyces*] *scabies*) [*R.A.M.*, 33, p. 556] on the Katahdin variety in inoculated soil [34, p. 174] from 78·5 per cent. (untreated) to 29·8 and 26·6 per cent., respectively, at concentrations of 100 and 150 lb. per acre, 200 lb. being phytotoxic. In 1953 sulphur (400 and 800 lb.) reduced the percentage of scab but was less effective than PCNB.

GIGANTE (R.). **Ricerche sulla trasmissibilità della maculatura ferruginea dei tuberi di Patata.** [Researches on the transmissibility of rust spot of Potato tubers.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 11 (*1953*), pp. 133–148, 1 fig., 1954. [English summary.]

Experiments carried out at the Plant Pathological Station, Rome, during the period 1950 to 1953 demonstrated that internal rust spot of potato tubers [*R.A.M.*, 25, p. 520] was not transmitted by tuber and shoot grafting or by inoculation of healthy potato and other plants with sap from plants produced by affected tubers, indicating that the disorder in Italy is not of virus origin. It occurred in soils that were compact and loose, clay and sandy, and dry as well as moist [cf. 23, p. 89; 27, p. 153]. In 1952 in seven widely separated localities the most susceptible varieties were Oberarnbacher Frühe, Home Guard, Sharp's Express, Majestic, Wekaragis, Wiga, and Étoile du Léon, maximum tuber incidence being, respectively, 92, 84, 76, 63, 64, 60, and 56 per cent.

The author's observations and growers' reports indicated that the condition develops during the later stages of growth of the tubers. It is probably associated with the alternation of dry and damp periods, especially during tuber formation.

URITANI (I.) & AKAZAWA (T.). **Antibiotic effect on Ceratostomella fimbriata of ipomeamarone, an abnormal metabolite in black rot of Sweetpotato.**—*Science*, 121, 3137, pp. 216–217, 1955.

In experiments at the Laboratory of Biological Chemistry, Nagoya University, Anjo, Japan, with a spore-cell suspension of *Ceratostomella* [*Ceratocystis*] *fimbriata* from a shake culture and mycelium from a surface culture, ipomeamarone [*R.A.M.*, 34, p. 247], even in a low concentration, prevented the absorption of inorganic phosphate by the fungus from the medium and its conversion from an inorganic to acid-soluble organic and insoluble form. It appears that ipomeamarone plays a part as an uncoupler in the resistance of the sweet potato root to *C. fimbriata*. Since the oxidative product of chlorogenic acid [loc. cit.] repressed the oxidative phosphorylation of sweet potato particles, it is probable that this product, produced by polyphenol oxidase in the infected tissues, may be a factor in resistance.

TASUGI (H.). **Studies on the downy mildew of Rice plant caused by Phytophthora macrospora Ito et Tanaka.**—*Bull. nat. Inst. agric. Sci.*, Ser. C, 2, pp. 1–48, 55 figs., 1953. [Japanese, with English summary.]

An extensive, illustrated description is given of studies to clarify the morphology,

physiology, life-cycle, and host range of the downy mildew of rice and other grasses, *Phytophthora* [*Sclerospora*] *macrospora* [*R.A.M.*, 32, p. 631]. Mature sporangia were produced on infected tissue immersed in water after four hours at 19° C. and germinated after five hours. The sporangia are largest at 21° C., becoming smaller with a rise or fall in temperature, the whole variation being from 61 to 90 μ in length by 25 to 63 μ in width. They germinate, by liberating zoospores, between 7° to 32° C., with an optimum of 18° to 23° C. at pH 5·0 to 6·0. Oospores germinate in water between 10° and 26° C. with an optimum of 19° to 20° at a pH of 7·0 by producing sporangia 70 to 87 by 18 to 40 μ. The former continue to germinate under field conditions for two to three years and can remain viable for five years. When diseased rice leaves are eaten by grasshoppers (*Oxya velox* and *O. japonica*) the oospores are excreted to germinate and cause infection of young rice tissues in the following season; infection may also arise from overwintering rice debris. The fungus can infect many cereal crops, including wheat and barley, and wild grasses.

Gorenz (A. M.). **Diplodia infection of Hevea buddings and its prevention by the use of a protective fungicide.**—*Circ. U.S. Dep. Agric.* 913, 22 pp., 3 figs., 1953.

During the investigations carried out from 1948 to 1951 at the Campo Experimental de Hule, El Palmar, Veracruz, Mexico, in co-operation with the Mexican Ministry of Agriculture, infection of the bud patch of *Hevea* buddings by *Diplodia* [*Botryodiplodia*] *theobromae* [cf. *R.A.M.*, 34, p. 176] was found to be chiefly responsible for budding failure. In Mexico the fungus was observed, either alone or with other fungi, on the leaves, branches, and maturing seed pods of rubber trees and it invariably followed sunscald injury. Budding during the periods unfavourable for the growth of the rubber tree often resulted in the death of the cambium beneath the bud patch and in the spread of the fungus even to the surrounding bark. Of the fungicides tested as possible budding protectants non-toxic to the cambium, fermate (200 gm. per l. of water) was the most satisfactory resulting in 97·5, 98·8, and 78·7 per cent. average budding success in the three tests, respectively, as against 17·5, 45, and 5·3 per cent., respectively, for the controls. The fungicides, as water suspensions, were applied with a cloth to the budwood and around the budding panel of the stock plant before the budding operation.

Newsam (A.). **Pathological Division.**—*Rep. Rubb. Res. Inst. Malaya, 1952*, pp. 58–72, 1954.

In this report [cf. *R.A.M.*, 33, p. 256] it is stated that foliage inspection of young rubber trees was inadequate for detecting root disease fungi (*Fomes lignosus* [34, p. 61], *Ganoderma* [*pseudoferreum*], and *F. noxius*: 33, p. 560]). When the leaves wilt, the collar is already dead and eradication becomes necessary, whereas collar inspection permits detection and treatment in time to save the tree. In a replanting experiment on Carey Island about 75 per cent. of the lateral roots were alive on non-poisoned stumps in 1952; ringbarking and fissure-poisoning had reduced the percentage after one year to 25 (less than 10 on standing trees) and the auger method to one. In trials designed to modify the soil microflora by different treatments and then to measure the effect on the rate of spread of root diseases, preliminary counts of soil fungi indicated that the best represented groups are those which produce antibiotics and that the cultivation of legume creepers reduces the population of *Trichoderma viride* [33, p. 256] and increases that of *Aspergillus* sp.

In field trials with tar oil fungicides for the control of mouldy rot [*Ceratocystis fimbriata*: cf. 33, p. 258] a phenolic fraction gave good results. Synthetic fungicides were effective in the laboratory at concentrations of 0·01 per cent. for four cationic detergents and 0·2 for an organo-mercurial, the phytotoxic limit being 1 per cent. or higher; a proprietary tar oil emulsion proved effective at 5 per cent.

Reports were received of 77 slight to moderately severe outbreaks of secondary leaf fall. The season had been favourable to *Gloeosporium albo-rubrum*, which was associated with 54 per cent. of the cases, *Oidium heveae* being much less prominent than usual (76 per cent.). Five outbreaks of late secondary leaf fall were all predominantly due to *G. albo-rubrum*.

In aerial spraying trials for the defoliation of rubber trees as a possible measure for the eradication of South American leaf blight [*Dothidella ulei*: 34, p. 60], should it ever be introduced into Malaya, 1 gal. per acre 5 per cent. n-butyl ester of 2, 4, 5-T dissolved in diesoline with 0·01 per cent. pentachlorophenol resulted in almost complete defoliation (with slow refoliation) of old trees.

Bonnier (C.) & Hely (F. W.). **Influence de certaines résines synthétiques, améliorant la structure du sol, sur la population fongique d'un sol.** [The influence of certain synthetic resins improving soil structure on the fungal population of a soil.]—*Bull. Inst. agron. Gembloux*, 21, 1–2, pp. 14–28, 6 figs., 1953.

In experiments carried out at the Institute of Agronomy, Gembloux, Belgium, the soil conditioners aglusol (a Belgian product) and krilium (formulation 9, an American product) stimulated mycelial development in a very fertile soil from central Belgium, physically favourable to mould growth of such fungi as *Mucor* sp., *Fusarium* sp., and *Penicillium candidum*, but reduced the numbers of those with more abundant sporulation and less vegetative development, such as *P. glaucum* and *Aspergillus niger*.

Pai (K. V. S.). **Carbon, nitrogen, and pH relationships to growth of soil Fusaria in culture.**—*Proc. Indian Acad. Sci.*, Sect. B, 37, 4, pp. 131–148, 4 figs., 1953.

Results are given of cultural experiments performed at the University Botany Laboratory, Madras, with *Fusarium vasinfectum* and *F. moniliforme* [*Gibberella fujikuroi*] on a variety of culture media with various sources of nitrogen [see next abstract]. This is part of an investigation of the contradictory reports of the effects of the application of nitrogenous fertilizers on cotton and rice wilts.

Subramanian (C. V.) & Pai (K. V. S.). **Relation of nitrogen to growth and sporulation of Fusarium vasinfectum Atk.**—*Proc. Indian Acad. Sci.*, Sect. B, 37, pp. 149–157, 1953.

In a cultural study of *Fusarium vasinfectum* [see preceding abstract] the use of ammonium sulphate as the nitrogen source resulted in a reduction of the pH to 2 in 21 days, while with potassium nitrate, ammonium nitrate, and urea the pH was raised to 6 to 7·2. The greatest amount of growth was obtained with potassium nitrate at 140 mg. per 100 ml. and the least with ammonium sulphate at all levels. The maximum accumulation of nitrogen in the mycelium was produced by ammonium sulphate and a high level of urea, while the least amount of residual nitrogen remaining in the medium followed the use of urea. The most favourable medium for sporulation contained urea at 140 mg. per 100 ml.

Thornton (R. H.). **Features of growth of Actinomyces in soil.**—Reprinted from *Research*, 6, 6, 3 pp., 1953.

The growth of actinomycetes in unsterile soil in Wellington, New Zealand, was studied by means of the Rossi-Cholodny technique [*R.A.M.*, 12, p. 324]. A close association was observed between *Rhizoctonia*-like hyphae and those of more slender *Actinomyces* spp. in 1,127 out of 1,765 microscope fields exhibiting the former. The association is considered to be akin to the rhizosphere association of

higher plants, and may be a factor influencing the distribution of actinomycetes in soil.

NAVARRO DE PALENCIA (J.). **Los ataques del 'Fusarium' a la Adormidera.** [The attacks of *Fusarium* on the Opium Poppy.]—*Bol. Inst. Invest. agron., Madr.*, 14, 31, pp. 377–381, 4 figs., 1954.

During the last seven years the author has observed outbreaks of an opium poppy fusariosis in various parts of Spain, including Valencia in 1948 and Valladolid in 1953 and 1954. The disease occurs at an advanced stage of growth, causing a foliar wilt and rapid total desiccation of the plants. The causal organism, identified by [M.] Benlloch as *Fusarium martii* or *F.* [*oxysporum* var.] *cubense*, produces a brownish-red discoloration of the roots and its mycelium obstructs the translocation of the sap through the woody vessels, resulting in the above-mentioned aerial symptoms. Control presents a difficult problem, and only preventive measures can be recommended, including avoidance of planting sites with an acid reaction; application of lime to the soil at the rate of 1,500 to 2,000 kg. per ha.; crop rotation; and cultivation of the Strubes or Mahndorfer varieties in place of the susceptible Peragis.

TALBOYS (P. W.). **Detection of vascular tissues available for water transport in the Hop by colourless derivatives of basic dyes.**—*Nature, Lond.*, 175, 4455, p. 510, 1955.

In the course of a study at East Malling Research Station of the host-parasite relations in *Verticillium* wilt of the hop [*V. albo-atrum*: see next abstract] the extent of obstruction in the vascular cylinder was determined satisfactorily by means of colourless forms of basic fuchsin and crystal violet treated with approximately 5 and 10 ml. sodium metabisulphite, respectively. When applied through the stem bases or by petiole injection they stained the vascular elements intensely in the immediate vicinity within one to three minutes, and were conducted throughout the vascular system of a healthy plant at a rate comparable with that of mobile acidic dyes. Sections cut from the stained material were counter-stained with 1 per cent. light green in 95 per cent. ethanol and dehydrated for the preparation of permanent mounts without loss of stain from the vessel walls. As the basic fuchsin derivative appears to be relatively non-toxic, it may be useful in growth studies for 'marking' vascular tissues *in situ* in growing plants.

Institute of Brewing Hop trials. Wye variety 1951 crop. Submitted by the Advisory Sub-Committee on Hops. Institute of Brewing Hop trials: 1952 crop. Submitted by the Hops Advisory Committee.—*J. Inst. Brew.*, N.S., 51, 1, pp. 5–11; 5, pp. 414–419, 1954.

Large-scale commercial spring and autumn trials were conducted by 11 breweries in 1952 on four new hop varieties from Wye College, Kent, two of which, Keyworth's Early and Keyworth's Midseason, are resistant to wilt (*Verticillium* [*albo-atrum*: *R.A.M.*, 33, p. 260 and preceding abstract]). The physical condition of the hops was reported to be generally satisfactory and little deterioration of any moment occurred in non-refrigerated storage from April to November, but there was some loss of α-resin, especially in the wilt-resistant varieties.

In 1953 five wilt-tolerant varieties were tested as copper hops on the brewery scale and four in the miniature brewery. Although 1147 is preferred to the two other varieties available commercially, OR 55 and OJ 47, it does not appear to be of outstanding merit. The most promising of the other varieties tested was D1, while OT48 (Bramling Cross), C2, and D5 found a measure of acceptance. The varieties C2, D1, and D3 are symptomless carriers of hop mosaic virus [loc. cit.],

while 1147 and D1 are susceptible to downy mildew [*Pseudoperonospora humuli*: loc. cit.], and C2 as a late hop may also call for special measures against the latter disease.

Bruehl (G. W.). **Identification, occurrence, and distribution of strains of Sugar-cane mosaic in Puerto Rico.**—*J. Agric. Univ. P.R.*, 38, 4, pp. 188–198, 1 graph, 1954. [Spanish summary.]

The completion of the survey made in 1952–3 of the strains of sugar-cane mosaic virus present in Puerto Rico [*R.A.M.*, 33, pp. 181, 632] revealed that A, B, and D formed the bulk of the collections. As before B was the most prevalent in the field, particularly on B.H. 10 (12), B. 34104, and M. 336; D was equally abundant only on B. 37161. Since A was the most easy to transmit mechanically, it would appear that the vectors may transmit B more efficiently than A. It is essential to keep B. 37161, which possesses some resistance to strain B, free from mosaic to prevent any increase in strain D. Mechanical transmission by the Seín method (*Proc. int. Soc. Sug. Cane Technol.*, 1932) gave a better correlation with varietal reaction in the field than that of Matz [*R.A.M.*, 12, p. 660].

Chona (B. L.). **Studies on the diseases of Sugarcane in India. IV. Relative resistance of Sugarcane varieties to red rot.**—*Indian J. agric. Sci.*, 24 (*1954*), 4, pp. 301–315, 1955.

In further experiments conducted at the Agricultural Sub-Station, Karnal, India, each season from 1936 to 1949 [cf. *R.A.M.*, 31, p. 87], seed-cane material, including varieties of the wild sugar-cane (*Saccharum spontaneum*), was tested for resistance to red rot (*Colletotrichum falcatum*) [*Glomerella tucumanensis*: 33, p. 633]. The material was originally obtained from the Sugarcane Breeding Station, Coimbatore [33, p. 562], but from 1945 onwards was taken from the Karnal Station. Towards the end of September or beginning of October, standing, full-grown canes of the same age and stage of growth were inoculated about 1 ft. above the ground by the plug method with the most virulent strains available. The average linear spread of infection was taken as the criterion. Of the 206 cane varieties tested, 13 proved resistant, namely, the Co. lines 349, 356, 441, 532, 547, 548, and 549, B.O. 4, Co. K. 34, Chunnee, and the *S. spontaneum* lines from Coimbatore, Burma, and Glagah, Java; 82 were moderately resistant, and 50 susceptible; 61 varieties need further testing.]

Batista (A. C.). **Nova contribuição ao estudo dos fungos pernambucanos.** [New contribution to the study of Pernambucan fungi.]—*An. Soc. Biol. Pernambuco*, 12, 1, pp. 39–47, 1954.

Included in this annotated list of 12 new species of fungi collected during 1953 in Pernambuco, Brazil [cf. *R.A.M.*, 33, p. 689], are *Septoria ananassicola* forming elliptical to elongated, marginal, cinereous lesions, up to 5 cm. in length, on both sides of the leaves of *Ananas* sp.; *S. sapotae* producing ferruginous spots with a chestnut-coloured to black halo, 3 to 9 cm. in length, nearly always covering half the leaf surface of *Achras zapota*; and *Sphaerognomonia elaeicola* on oil palm foliage.

Septoria ananassicola is characterized by globose, immersed, later erumpent, chestnut-coloured to black, indistinctly ostiolate pycnidia, 105 to 165 μ in diameter, and filiform, septate, guttulate, hyaline conidia 25 to 70 by 2 to 3 μ. The black pycnidia of *S. sapotae*, also globose and immersed to erumpent, with an inconspicuous ostiole, measure 64·5 to 118 μ in diameter, and the filiform, hyaline conidia 9·5 to 26·5 by 2 μ. *Sphaerognomonia elaeicola* produces immersed to erumpent, clypeate, amphigenous, globose to depressed, chestnut-coloured perithecia, 95 to 140 μ in diameter, with a perforate ostiole, and cylindrical or clavate, subsessile, fasciculate, aparaphysate asci, each containing eight botuliform, polystichous, continuous, hyaline ascospores, 7·5 to 15 by 4 to 7·5 μ.

Batista (A. C.). **Novos fungos do gênero Micropeltis.** [New fungi of the genus *Micropeltis*.]—*An. Soc. Biol. Pernambuco*. 12. 1. pp. 49–54, 1954.

Diagnoses are given of eight new species of *Micropeltis* collected during 1953 in Pernambuco, Brazil [cf. *R.A.M.*, 33, p. 638 and next abstract].

Batista (A. C.) & Vital (A. F.). **Adenda à micoflora de Pernambuco.** [Addenda to the mycoflora of Pernambuco.]—*An. Soc. Biol. Pernambuco*. 12. 1. pp. 55–61, 1954.

This annotated list of seven new species of fungi collected during 1953 in Pernambuco, Brazil, comprises five of *Micropeltis* [cf. preceding abstract]. *Marssonina artocarpi*, which forms light brown, marginal lesions, up to 5 cm. in length, on jak tree leaves, is characterized by filiform, hyaline conidiophores, up to 25 μ long, and oblong to clavate, uniseptate, hyaline conidia, 12·5 to 27·5 by 2·5 to 5 μ.

Govindu (H. C.) & Thirumalachar (M. J.). **Notes on some Indian Cercosporae. IV.**—*Sydowia*, 8, 1–6, pp. 221–230, 4 pl., 1954.

Among the 25 species of *Cercospora* (including seven new ones and a new variety) comprised in this continuation of the authors' studies [*R.A.M.*, 33, p. 450 and next abstract] may be mentioned *C. unamunoi* on chilli (*Capsicum frutescens*) [27, p. 406] in Madras and *Cercospora diffusa* [24, p. 51] on tomato in Mysore. The latter species becomes completely overgrown by the sooty patches of a *Cladosporium* sp. producing uni- or bicellular spores.

Thirumalachar (M. J.) & Govindu (H. C.). **Notes on some Indian Cercosporae. V.**—*Sydowia*, 8, 1–6, pp. 343–348, 2 pl., 1954.

Included in this further list of *Cercosporae* [see preceding abstract] are five new species and a new combination. *C. artocarpi* forms large, brown patches which later fall out, producing a shot-hole effect, on the leaves of *Artocarpus communis* in Bangalore.

Petrak (F.) & Ahmad (S.). **Beiträge zur Pilzflora Pakistans.** [Contributions to the fungus flora of Pakistan.]—*Sydowia*, 8, 1–6, pp. 162–185, 1954.

Included in this critically annotated list of fungi from Pakistan, in addition to 29 new species and a new combination, is a record of *Cladosporium cucumerinum* on vegetable marrow leaves.

Pavgi (M. S.) & Thirumalachar (M. J.). **Some new or interesting Physoderma species from India. II.**—*Sydowia*, 8, 1–6, pp. 90–95, 2 pl., 1954.

Five of the seven species of *Physoderma* described in this further contribution from Uttar Pradesh, India [*R.A.M.*, 33, p. 430], are new, including *P. cynodontis* and *P. setaricola*.

P. cynodontis produces on the leaves of *Cynodon dactylon* circular to elongated, light brown spots, 1 to 3 by 0·5 to 1·5 mm., surrounded by a yellow halo, causing premature desiccation in cases of severe infection. One or two yellowish-brown, ovate to subglobose sporangia, 15·7 to 38·5 by 11·5 to 28·5 (mean 22·2 by 17) μ were found within each of the infected mesophyll cells.

The leaf sheaths and stems of *Setaria glauca* attacked by *P. setaricola* bear dark olive-green to brownish, coalescent streaks, 1 to 1·5 mm. long. Each cell contains two to three globose to ovate, pale yellowish-brown sporangia, 17·2 to 33 by 14·3 to 24·3 (22·6 by 18·7) μ.

Very severe infection of *Echinochloa crusgalli* by *P. echinochloae* [33, p. 235] was also observed at Banaras.

Petrak (F.). **Beiträge zur Pilzflora von Britisch Nord-Borneo.** [Contributions to the fungus flora of British North Borneo.]—*Sydowia*, 8, 1–6, pp. 12–26, 1954.

Included in this critically annotated list of fungi collected by J. and M. S. Clemens in British North Borneo, besides 14 new species and one new name, is *Ustilaginoidea viridis* [*U. virens*] on rice [cf. *R.A.M.*, 31, p. 456].

Ciferri (R.). **Schedae mycologicae XII–XXXIV.** [Mycological specimens XII–XXXIV.]—*Sydowia*, 8, 1–6, pp. 245–270, 6 figs., 1954.

Included in this continuation of the author's critical study on mycological specimens, the first part of which appeared in *Mycopathologia*, 6, pp. 19–27, 1951, are five new genera, a new subgenus, 13 new species, six new combinations, and two new names. Mention may be made of the following records, all from the Dominican Republic. *Cercospora tagetes* n.sp., which forms irregular, greenish- to dirty yellow discolorations on both leaf surfaces of *Tagetes patula*, is characterized by brown to blackish, simple, cylindrical, three- to eight-septate, straight or curved conidiophores, 70 to 200 (mostly 90 to 150) by 3 to 4·5 μ, arising in fascicles of 5 to 15 and producing at or near their apices acicular to fusiform, very narrowly cylindrical, or fusoid, subhyaline or hyaline, four- to ten- (usually six- to eight-) septate conidia, 72 to 120, often 44 to 80, by 3 μ at the base and 1 to 1·5 μ at the apex, occurring singly or in evanescent chains of two to three.

Oreophylla angelaemariae n.sp. is the agent of a leaf spot of *Glyricidia saepium*.

An emended diagnosis is given of the genus *Vasculomyces* Ashby, the type species of which, *V. xanthosomae*, was originally described on *Xanthosoma* from Jamaica in *Bull. Dep. Agric. Jamaica*, 2, p. 150, 1913. The fungus is not uncommon on semi-decayed roots of *X. sagittifolium* and other *X.* spp. in the rain forest belt of the Dominican Republic, frequently in association with a *Fusarium* of the *oxysporum* group and foliar infection by *Phytophthora colocasiae* [*R.A.M.*, 31, p. 54]. *V. xanthosomae* produces intercalary and apical, sessile, hyaline to yellowish chlamydospores of very variable shape, typically concatenate, the acrogenous chains consisting of 30 to upwards of 50 and the intercalary of two to five elements, measuring 14 to 19 by 7 to 12 or up to 32 by 15 μ with a smooth epispore 2 to 3 μ thick.

Monosporium uredinicolum is a fairly common hyperparasite of *Coleosporium ipomoeae* on sweet potato leaves [25, p. 141]. *M. uredinicolum* agrees with the description of *Oospora uredinis*, but further studies on authentic material are essential to confirm the provisionally accepted identity of the two species.

Albugo candida [*Cystopus candidus*] has been collected on turnip [cf. 27, p. 542].

Cooke (W. B.) & Shaw (C. G.). **The Suksdorf fungus collections.**—*Res. Stud. St. Coll. Wash.*, 21, 1, pp. 3–56, 1953.

This is a continuation of the list of fungus specimens collected by Suksdorf [*R.A.M.*, 32, p. 340] and distributed in the Mycological Collections, Bureau of Plant Industry [Beltsville, Maryland], the New York Botanical Garden, and the Herbarium, University of Minnesota.

Cooke (W. B.). **The genera of the Homobasidiomycetes.**—*Spec. Publ. Plant Dis. Surv.* 3, 100 pp., 1953. [Mimeographed.]

This list of genera contains all those published up to 1st September, 1952, in the families Clavariaceae, Agaricaceae, Boletaceae, Hydnaceae, Polyporaceae, and Thelephoraceae, and includes 1,403 Friesian and post-Friesian and 118 pre-Friesian names. The bibliography of 37 titles contains (as well as citations for individual genera) the sources of obscurely published and pre-Friesian genera, and of discussions of various genera from the point of view of validity or conservation.

In this work no effort has been made to correlate a particular genus with a closely related one or a synonym, but in a few cases the writer has inserted a generic name after the type or lectotype to indicate a possible relationship for the benefit of future workers.

Müller (E.). **Beiträge zur Kenntnis der Gattung Gibbera Fr. emend. Petr.** [Contributions to the knowledge of the genus *Gibbera* Fr. emend. Petr.]—*Sydowia*, 8, 1–6, pp. 60–73, 9 figs., 1954.

Following an introductory note on the systematic position of *Gibbera* [*R.A.M.*, 29, p. 334] and its relationship to *Venturia* [32, p. 698] and other genera, a critically annotated list is given of eight species, including four new ones, two new combinations, and a new name.

Fraser (Lilian). **A new genus of the Plectascales.**—*Proc. Linn. Soc. N.S.W.*, 78, 5–6, pp. 241–246, 1 pl., 29 figs., 1953. [Received March, 1955.]

A description is given of *Xeromyces bisporus* n.sp., the type species of a new genus in the Plectascales, which was isolated from mouldy liquorice sticks. In culture abundant cleistocarps were formed, with pale yellow, fusiform ascospores 9 to 11 by 4 to 5 μ, two per ascus. Smooth aleuriospores with a moderately thick wall and measuring 15 to 18 by 11 to 14 μ when unicellular or 17 to 35 by 11 to 15 μ when occasionally 2- to 3-celled were produced terminally on lateral branches.

Stroube (W. H.). **Host range of the Rhizoctonia aerial blight fungus in Louisiana.**—*Plant Dis. Reptr*, 38, 11, pp. 789–790, 1954. [Multilithed.]

Included in this list of economic and wild plants on which *Rhizoctonia* [*Corticium*] *sasakii* (or *Pellicularia filamentosa* f. [sp.] *sasakii*) [*R.A.M.*, 33, p. 367] occurs naturally in Louisiana are soy-bean and rice. Inoculated in the greenhouse, oats, lucerne, and wheat were susceptible; Dallis grass (*Paspalum dilatatum*), rice, and rye showed some resistance.

Snyder (W. C.) & Hansen (H. N.). **Species concept, genetics, and pathogenicity in Hypomyces solani.**—*Phytopathology*, 44, 7, pp. 338–342, 2 figs., 1 diag., 1954.

This discussion, presented at the Symposium on Genetics of Phytopathogenic Fungi in Relation to Basic Problems of Infectious Disease at Madison, Wisconsin, on 7th September, 1953, of current studies on the taxonomy, genetics, and pathogenicity of *Hypomyces solani* [*R.A.M.*, 28, p. 229] and its diverse clones, e.g., f. *cucurbitae* [28, p. 346; 33, p. 245], is based on 20 contributions to the relevant literature.

Eden (T.). **Blister blight disease of Tea.**—London, H.M. Stationery Office, 5 pp., 4 pl., 1953. 9*d*.

This publication on the history, etiology, symptoms, and control of blister blight [*Exobasidium vexans*: *R.A.M.*, 33, p. 53] is intended primarily for the use of tea planters in Africa, where the disease is unknown, to enable them to control it should the pathogen be introduced.

Loos (C. A.) & Webster (B. N.). **Reports of the Pathological Division for the years 1952 and 1953.**—*Bull. Tea Res. Inst. Ceylon* 34, pp. 40–49; 35, pp. 45–54, 1954.

In the 1952 report on general pathology [cf. *R.A.M.*, 33, p. 53] C. A. Loos states that for the first time in the history of the country almost the total acreage of tea in up-country areas subject to both monsoons was under fungicidal protection against blister blight [*Exobasidium vexans*: 34, p. 263]. St. Coombs No. 9 Field

Crop Protection experiment [33, p. 53] was pruned in June. The results for the 3½-year cycle from May, 1949, were as follows: unprotected, 2296 lb. made tea per acre; sprayed weekly with 4 oz. perenox in 10 gals. water, 2897 lb.; and sprayed fortnightly, 2759 lb. The effects of blight were also reflected in the production of maintenance foliage and wood. The St. Coombs No. 8 experiment completed three years at the end of December. The results for the whole period were: plot A (unprotected), 2445 lb.; B (protected every 9 to 10 days during both monsoons), 3245 lb.; and C (during the south-west monsoon only), 2921 lb. On St. Coombs No. 2 field the loss per acre from fish leaf plucking and resting compared with normal plucking with spray protection was 611 lb. made tea per acre for the period April, 1951, to 31st December, 1952. As a means of controlling blister blight it is neither economical nor practical.

In the mycological section (pp. 45–49) B. N. Webster states that a previously unrecorded disease of *Acacia elata*, characterized by severe branch and stem cankers which eventually girdle and kill the tree, is under investigation. Infection appears to originate at branch crotches and pruning spurs. He also found that efficient protection against *E. vexans* appeared to be secured on the Meddecoombra North Estate using the Boomjet Nozzle OC—O2 [34, p. 263]; 1,200 bushes were covered by the double nozzle in the time taken to cover 700 by a single nozzle. A low-volume mistblowing trial with Shell copper fungicide at 6 oz. to 1½ gals. water per acre was laid out on St. Coombs No. 8 experimental area in comparison with knapsack spraying with 4 oz. perenox in 10 gals. water at 15 gals. per acre. The average percentage infected flush at each pluck was 42·8 per cent. (unsprayed); 10·4 and 14·4 per cent. with the knapsack and mistblower used in both monsoons; and 11·7 and 20 per cent., respectively, in the south-west monsoon only.

Rhizoctonia [*Corticium*] *solani* attacked mature tea [16, p. 152] in the Ratnapura area in epidemic proportions causing heavy defoliation.

In the 1953 report C. A. Loos records that almost all the total tea acreage was again under fungicidal protection during the monsoon months. St. Coombs Crop Protection experiment No. 8 was pruned in June–July. Plots B and C, sprayed throughout recovery, were tipped on 3rd October and yielded, respectively, 196 and 171 lb. made tea per acre up to the end of the year, while A (untreated) suffered so severely from blister blight that only a small percentage of bushes was ready for tipping by 21st December.

In the mycology section B. N. Webster reports that early in the year an estate at Dimbula suffered some degree of mortality from *Ganoderma applanatum* [cf. 27, p. 260], fructifications of which were visible both on the tea bushes and on adjacent, recently cut *Albizzia moluccana* stumps. It appeared that the fungus attacked only those bushes that were already weakened by meadow eelworm. The disease of *Acacia elata* was again prevalent; 131 diseased trees were removed from the original area in 1953. A fungus tentatively identified as *Aposphaeria* sp. was constantly associated with the lesions and cankers but all attempts at artificial inoculation have failed. Dead yellow mites (*Hemitarsonemus latus*) in the field and in slide humidity chambers in the laboratory yielded isolates of *Scopularia* sp.

Two new dispersible copper fungicides in paste form were tested for the control of *E. vexans* during the north-east monsoon. 'Ialine' colloidal copper, based on copper carbonate, applied at 1½ lb. per acre at a cost of Rs. 1.50, gave satisfactory control and was equivalent to perenox at 6 oz. per acre costing about R. 1.

Kovachevsky (I. H.). Живовлечната мозаика по Тютюна. [Plantago mosaic of Tobacco.]—Изв. микробиол. Инст., София [*Bull. microbiol. Inst., Sofia*] 4, pp. 109–129, 5 pl., 1953. [Russian and German summaries.]

A tobacco virus disease, previously unrecorded in Bulgaria, was observed in several tobacco growing regions of the country and the virus, which is very reminiscent

of tobacco mosaic virus [*R.A.M.*, 4, p. 446], was studied at the Institute of Plant Protection, Sofia. The disease, which develops rapidly during the autumn-winter period, is characterized by arrested growth of the plant and wilting of the lower and eventually of the upper leaves. The necrotic symptoms are less prominent in the summer, or even absent on some varieties, e.g., Samsun. All the 74 varieties of tobacco tested by rubbing the leaves, in which infection remained localized as in the case of tobacco mosaic virus in *Nicotiana glutinosa*, are considered for all practical purposes to be resistant to this virus, which is regarded by the author as identical with plantago mosaic virus [a strain of tobacco mosaic virus: 22, p. 328; 33, p. 203], paramosaic virus [28, p. 88], and *Nicotiana* virus 5 [a strain of tobacco streak virus: 10, p. 562]. It is distinguished from tobacco mosaic virus by the smaller size of the light green spots forming the mosaic pattern, the absence of swelling and yellow or yellowish-green colour of these spots, the difficulty of infecting tomato and pepper plants, and the ease of infection of plantain (*Plantago major*).

Gigante (R.). **Osservazioni sul verderame delle foglie di Tabacco.** [Observations on 'verderame' of Tobacco leaves.]—*Tabacco, Roma*, 57, 651, pp. 336–353, 9 figs., 1953. [English summary.]

A full description is given of 'verderame' or green spot of curing tobacco leaves [*R.A.M.*, 15, p. 689], which is very prevalent in southern Italy, particularly in Apulia. With very few exceptions, the leaves that become affected are those showing symptoms of tobacco mosaic virus. In one instance the condition was observed on withered leaves still attached to a mosaic tobacco plant. Green areas were also noted on withered tobacco leaves displaying symptoms of yellow tobacco mosaic [a strain of tobacco mosaic virus], and on dried tobacco leaves previously submitted to pressure and bruising. The author considers that the persistence of the green areas may, perhaps, be due to a direct or indirect inhibitory action of the tobacco mosaic virus on the disintegration of chlorophyll. [This paper also appears in *Boll. Staz. Pat. veg. Roma*, Ser. 3, 11 (*1953*), pp. 85–102, 1954.]

Basler (E.). **Relations between the nucleic acids of Tobacco leaf and the biosynthesis of Tobacco mosaic virus.**—*Diss. Abstr.*, 14, 10, pp. 1509–1510, 1954.

At Washington University the nucleic acids of the tobacco plant were studied in relation to the reduplication of tobacco mosaic virus [*R.A.M.*, 34, p. 263] by comparing the biochemistry of the acids of normal and virus-inoculated leaves. Soon after inoculation the virus produced an accumulation of excess nucleic acid in the water-insoluble nucleoprotein of the leaf prior to the appearance of new virus. When the virus appeared the excess acid disappeared together with a certain amount of normal host nucleic acid. The changes induced by infection in host nucleic acid were closely related to the nucleic acid composition of the virus synthesized as a result of infection. In experiments using isotopic nitrogen (N^{15}) the major part of the acid in the virus was shown to be synthesized soon after inoculation either during the 80- to 120-hour period (with ammonium as the nitrogen source) or the 120- to 180-hour period (with asparagine).

It was concluded that part of the excess nucleic acid appearing in the insoluble protein is material which later appears as the nucleic acid of the virus. The protein portion of this appears to be synthesized for a longer period than the nucleic acid. Evidence of the heterogeneity of the nucleic acid found in the virus is presented.

Apple (J. L.). **Variation in pathogenicity of Phytophthora parasitica var. nicotianae.**—*Plant Dis. Reptr*, 38, 11, pp. 774–776, 1 fig., 1954. [Multilithed.]

A technique for determining variation in pathogenicity of *Phytophthora parasitica* var. *nicotianae* [*R.A.M.*, 33, p. 765; 34, p. 187] was developed in greenhouse

studies at North Carolina State College, Raleigh. Nine tobacco seedlings, transplanted when 2 in. high into an aluminium pan containing steam-sterilized sandy loam soil, were inoculated at 6 in. by flooding the pan with a mycelial suspension and kept at 85° to 95° F., daily counts being made of diseased or dying plants. Isolates ranged from those which were weakly pathogenic on the susceptible Bottom Special to those highly pathogenic on the moderately resistant Dixie Bright 101. Of some 160 isolates tested on Dixie Bright 101, 39 per cent. were classed with a low pathogenicity index, 46 per cent. intermediate, and 15 per cent. high. The results were confirmed by root-inoculating larger (2 ft.) plants in pots. The isolates collected from localities where the disease is severe apparently belong to the highly pathogenic group. This factor may be partially responsible for the failure of moderately resistant tobacco varieties to control black shank in many North Carolina fields.

Clayton (E. E.) & Grosso (J. J.). **Tobacco blue mold control with zineb dusts.** *Plant Dis. Reptr*, 38, 11, pp. 771–773, 1954. [Multilithed.]

At Beltsville, Maryland, tobacco dust was found to be less efficient than pyrophyllite as a carrier of zineb (10 per cent.) in the control of tobacco blue mould (*Peronospora tabacina*) [*R.A.M.*, 33, p. 765], the percentage control for the two mixtures, respectively, being 68 and 100 three days after the last application. In another experiment 20 per cent. zineb-tobacco dust gave 91 per cent. control compared with 100 per cent. for 10 per cent. zineb-pyrophyllite. When applied as sprays complete control was obtained with 10 per cent. zineb plus either carrier, indicating that zineb in both mixtures was active fungicidally.

Freeman (H.) & Paddick (R. G.). **Angular leaf spot of Tobacco in Victoria.**—*J. Dep. Agric. Vict.*, 53, 2, pp. 74–78, 3 figs., 1955.

During 1952–3 the tobacco varieties Virginia Gold, Yellow Special, and 401 in the Ovens Valley region of Victoria were affected both in the seed-bed and in the field by a disease agreeing in symptom expression, morphology, and physiology with that caused by the angular leaf spot bacterium (*Pseudomonas angulata*) [cf. *R.A.M.*, 34, p. 213]. This is the first record of the disease in Australia.

Mountain (W. B.). **Studies of nematodes in relation to brown root rot of Tobacco in Ontario.**—*Canad. J. Bot.*, 32, 6, pp. 737–759, 2 pl., 2 graphs, 1954.

Studies in the Department of Botany, University of Toronto, definitely established that the root lesion nematodes, *Pratylenchus minyus*, the most pathogenic, *P.* sp. from red clover, and possibly *P. penetrans*, are the primary causal agents of tobacco brown root rot in Ontario [*R.A.M.*, 30, p. 84], although the lesions produced are undoubtedly further broken down by the activity of other soil organisms. When a fresh tobacco root was added to a well-established colony of *P. minyus*, cultured aseptically on maize root tissue, the nematodes were attracted to it, attacking the growing point, causing cessation of growth, and the older mature region, where penetration occurred. After four to six days the cortical tissue began to break down and turn brown. The lesion did not become as advanced as in the soil, presumably owing to the absence of secondary organisms.

Nine other parasitic and potentially dangerous nematode genera are associated with tobacco roots in Ontario but occur in very low numbers. The size of the nematode population is directly related to the crops grown in preceding years, the presence of maize aiding considerably in their build-up. *P. minyus* caused little stunting of tobacco below 70°, the optimum being 100°. In the variety Green Briar an unusual resistance mechanism upholds a host-parasite equilibrium wherein,

despite high populations of parasitic nematodes within the roots, normal plant growth is maintained.

Schafer (L. A.). **The effect of nutrition on the susceptibility of Tomato, Lycopersicum esculentum Mill., to the early blight fungus, Alternaria solani (Ell. and Mart.) Jones and Grout.**—*Diss. Abstr.*, 14, 11, p. 1877, 1954.

At Cornell University [Ithaca, New York] Bonny Best tomato seedlings grown in 15 different nutrient solutions in sand culture [cf. *R.A.M.*, 32, p. 594; 34, p. 111] were inoculated at three weeks with spores of *Alternaria solani*. Infection was recorded 36 hours later. The minus phosphorus treatment gave the highest infection percentage and a nitrogen-deficient solution the least. The results obtained by growing tomato seedlings in soil with 14 different fertilizer treatments were similar to the sand ones. The percentage infection was increased by a combination of nutrients resulting in moderate to high nitrogen, phosphorus deficiency, and low to high potassium. Susceptibility to *A. solani* appeared to be definitely related to the nitrogen-phosphorus balance. Growth in the solution containing normal amounts of the three major elements but deficient in the minor elements was similar to the growth with the major elements at moderate to high levels and the minor elements present. Differences in the growth of the fungus were also observed when it was cultured in extract from tomato seedlings grown in various nutrient solutions [32, p. 594].

Day (M. F.) & Irzykiewicz (H.). **Physiological studies on thrips in relation to transmission of Tomato spotted wilt virus.**—*Aust. J. biol. Sci.*, 7, 3, pp. 274–281, 1954.

In studies at the Division of Entomology, Canberra, Australia it was ascertained that the pH values of the midguts of larval and adult *Thrips tabaci* and *T. imaginis* lie between 5 and 5·6, the oxidation-reduction potential at these values being between +0·184 and +0·262 V. Thus there is no difference between vectors of tomato spotted wilt virus [*R.A.M.*, 11, pp. 78, 549] and non-vectors. The conditions in the midgut of larval *T. tabaci* are unsuitable for long survival of the virus.

Differences in the amount of host material ingested by the insects were clearly unrelated to ability to acquire the virus. The results suggest that the virus may be protected from destruction in the midgut of the larvae and that such a protecting mechanism may be absent from the midgut of the adult. A test of this hypothesis gave no support to the suggestion.

Two further possible mechanisms remain to explain the ability of larval and inability of adult thrips to acquire the virus from infected plants. There may be differences between the permeability of the midgut in the two stages, or the virus may be unable to multiply in the tissues of the adult, though finding suitable conditions in the larva.

Holmes (F. O.). **Inheritance of resistance to infection by Tobacco-mosaic virus in Tomato.**—*Phytopathology*, 44, 11, pp. 640–642, 1 fig., 1954.

At the Rockefeller Institute for Medical Research, New York, some tomato plants of hybrid origin showing marked resistance to tobacco mosaic virus [*R.A.M.*, 23, p. 43] were crossed with commercial varieties. The experimental material was supplied by Frazier (*Proc. Amer. Soc. hort. Sci.*, 54, pp. 265–271, 1949) and comprised derivatives from *Lycopersicon chiloense*, *L. hirsutum*, *L. peruvianum*, and *L. pimpinellifolium*. The results of a study of the segregation of resistance to infection in successive generations of progeny produced by the crosses were compatible with the hypothesis that a single dominant gene controls enhanced resistance to infection. The resistant selections also escaped internal browning [*R.A.M.*, 29, p. 64]. True-breeding lines have not so far been obtained.

Rosa (M.). **Due anni di sperimentazione sulla lotta contro gli avvizzimenti precoci delle piante ortensi in Provincia di Salerno.** [Two years of experimentation on the control of early wilts of market-garden plants in the Province of Salerno.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 11 (*1953*), pp. 169–217, 3 figs., 6 graphs, 1954.

After stating that the early wilting of market-garden crops, particularly tomatoes, grown in the vicinity of Scafati, Italy, has been ascertained to be due to a complex of factors comprising (1) climatic conditions, (2) unsuitable cultural practices, and (3) animal parasites, fungal parasites of the aerial parts, including *Oidiopsis sicula* [*O. taurica*] (only of slight importance locally), *Alternaria porri solani* [*A. solani*: *R.A.M.*, 33, p. 767], which causes severe injury, systemic parasites (*Corynebacterium michiganense*, *Fusarium bulbigenum* var. *lycopersici*, and *Verticillium alboatrum*), and viruses, the author describes soil fumigation tests carried out in 1952 for the control of this condition. The best results were given by chloropicrin and C.B.P. soil fumigant (chlorobromopropene). The local varieties of tomatoes were definitely more resistant than American varieties.

In 1953 the soil fumigation tests were repeated, and chloropicrin again gave the best results. In spraying tests against *A. solani* [loc. cit.] the best control was again given by products with a zineb base.

Pantidou (Maria E.). **The foliage as a source of secondary inoculum for Tomato anthracnose and the non-specificity of the causal organisms.**—*Diss. Abstr.*, 14, 11, pp. 1901–1902, 1954.

Anthracnose caused by *Colletotrichum phomoides* is a major disease of tomatoes in New York State and is not yet under satisfactory control [*R.A.M.*, 33, p. 55]. Early in the course of this investigation at Cornell University [Ithaca, New York], it was found that tomato leaves harbour spores capable of producing anthracnose when transferred to tomato fruits [33, p. 123], and that the fungus can grow into the roots and base of the stem, thus offering a more assured means of survival. The ability of different isolates to grow into the roots and stems appeared to vary. Foliage infection was confirmed. *Glomerella cingulata* also caused primary infections on tomato leaves. Senescent leaf tissue and that killed by *Alternaria* or flea beetles provided the most favourable medium for growth and sporulation by anthracnose fungi. The longer the post-inoculation exposure to moisture the greater was the sporulation.

It was found that *C. phomoides* was as infective on foliage of Cucurbitaceae as was the squash anthracnose fungus [*C. lagenarium*]. The symptoms obtained on five cucurbit species varied from minute spots to irregular necrotic areas or leaf necrosis. Isolates of *Colletotrichum* and *G. cingulata* caused only a trace or no infection when inoculated to eight bean [*Phaseolus vulgaris*] varieties used as differential hosts for strains of *C. lindemuthianum*. *C. circinans* [33, p. 691] and *C. pisi* infected uninjured red tomato fruits though the lesions differed somewhat from those typical of anthracnose.

Possingham (J. V.). **The effect of molybdenum on the organic and inorganic phosphorus of plants.**—*Aust. J. biol. Sci.*, 7, 3, pp. 221–224, 1954.

In experiments carried out at the Division of Plant Industry, Canberra, Australia, molybdenum was applied, two days before harvesting the plants for analysis, to molybdenum-deficient three-week-old Pan-American tomato plants growing in water-culture solutions. The concentration of organic phosphorus was increased and that of inorganic phosphorus correspondingly decreased [cf. *R.A.M.*, 27, p. 401; 28, p. 500; 31, p. 466, *et passim*]. Molybdenum increased the yield of dry matter

and the absolute amount of phosphorus and of organic phosphorus, but not of inorganic phosphorus. The concentration of total phosphorus remained unaltered.

Report of the symposium on Birch dieback, Ottawa, Canada, March 21 and 22, 1952. —*Rep. Div. For. Biol., Dep. Agric. Can.*, Part I, pp. 1–108, 9 pl., 22 figs., 2 maps; Part II, pp. 109–182, 2 figs., 1953. [Mimeographed.]

The symposium was opened by a survey by R. E. Balch (pp. 1–5) of the history of birch die-back in New Brunswick [*R.A.M.*, 32, p. 43 and next abstract] where the disease was first recognized. It is concluded that the etiology of the disease may involve both biotic and physical factors. J. R. Hansbrough (pp. 6–7) outlines the history of the die-back in New England [32, p. 42] where it appears to be limited to old, overmature stands or to cut-over areas. R. V. Nash (pp. 8–9) and R. Pomerleau (pp. 10–11) describe the history of the disease in Maine and Quebec, respectively. The annual and total damage caused by birch die-back in the Maritime Provinces is estimated by G. W. Barter (pp. 12–33) after surveying 123 contributions to the literature. In New Brunswick 40 to 90 per cent. of yellow birch were dead in 1948 and 15 to 40 per cent. in Nova Scotia. It is concluded that factors other than precipitation deficiencies affect birch during the onset of die-back, and cause rapid decline.

Evidence of extension or intensification of the disease as indicated by the place and time of injury is put forward by G. W. Barter (pp. 34–41) for the Maritime Provinces, and by L. Daviault (pp. 42–49) and R. Pomerleau (pp. 50–51) for Quebec. Reduced growth due to die-back is not so closely correlated with dry weather as to warrant the assumption that this is the prime initial cause. The opinion is expressed that the term intensification of symptoms is preferable to that of spread, as no evidence is found of the extension of die-back from a central focal point in any area.

In the section devoted to the ecological, physiological, and bioclimatic relations of birch in different parts of its range G. C. Cunningham (pp. 52–56) gives an account of research on tolerant hardwoods. In the Great Lakes and St. Lawrence hardwood forests yellow birch does not compete very well with sugar maple [*Acer saccharum*], a much less desirable timber tree. Investigations into the silvicultural characteristics of yellow birch are outlined by D. H. Burton and A. P. Leslie (pp. 57–58). This species grows best on a deep, well-drained loam but, although ample seed is produced and germination is good, natural regeneration is impeded by the weakness of the seedlings, which fail to survive. Data are being collected on the effects of light and such edaphic factors as water and temperature relationships. Seasonal changes in the water content of trees with special reference to species of birch and to possible stress periods are discussed by R. D. Gibbs (pp. 59–69), while K. N. H. Greenidge (pp. 70–91) describes the moisture régimes of healthy and diseased birch [*R.A.M.*, 33, p. 389] and concludes that some factor other than absolute moisture must be determined. D. A. Fraser (pp. 92–108) outlines some ecological studies in a hardwood stand at the Forest Experiment Station, Chalk River, Ontario, with special reference to the condition of yellow birch. Radial increment curves showed no difference between normal healthy trees and those judged (externally) to be in the early stages of decadence. In advanced stages the radial increment curves were greatly reduced.

In the second part of this report, the first section is concerned with the possible effects of climate, soil, insects, and diseases on the development of birch die-back.

The relation between climate and die-back is investigated by J. Clark and F. K. Hare (pp. 109–113). Climatic analyses from 1900 to 1950 failed to reveal any evidence of correlation between water-deficient years and the spread of birch die-back, but conditions which initiated the disease might have been repeated progressively outwards. R. Pomerleau (pp. 114–117) surveys the relation between

environmental conditions and the dying of birches and other hardwood trees. It is concluded that the disorder is almost certainly due to physical causes in which unbalanced water relations play an important role.

The role of the bronze birch borer (*Agrilus anxius*) in relation to die-back in the Maritime Provinces is discussed by G. W. Barter (pp. 118–122), and is considered to be a major factor in the final death of trees affected by die-back. D. A. Quirke (pp. 123–127) deals with the role of insects in the deterioration of birch in Ontario, but concludes that *A. anxius* is not the primary agent. The significance of the fungi and viruses associated with birch die-back is discussed by J. R. Hansbrough (pp. 128–135). The three fungi most commonly isolated from the crowns of yellow birch (*Betula lutea*) and paper birch (*B. papyrifera*), namely, *Libertella betulina*, *Diatrypella betulina*, and *Tubercularia vulgaris*, gave only negative results in inoculation tests in 1946. In further tests, two years later, *Gelatinosporium fulvum*, *Melanconis stilbostoma*, *L. betulina*, and three *Fusarium* spp., all commonly isolated from die-back birches, proved to be saprophytic and a species of *Phomopsis* [31, p. 52], weakly parasitic. None of the fungi isolated from the roots or rhizospheres of affected trees have been tested for pathogenicity; only one, (?) *Cylindrocarpon orthosporum*, occurs with any frequency. Inoculation experiments have failed to show any relationship between a virus and the symptoms of birch die-back [27, p. 50]. It is concluded that although no infectious entity has been correlated with the incidence of die-back, more exhaustive studies are required before this point is definitely settled. D. R. Redmond (pp. 136–143) lists the root- and twig-inhabiting fungi of yellow birch and gives the results of inoculations with these isolates, some of which have already been noticed [31, p. 305].

Mycological investigations of birch in Ontario are outlined by Ruth Horner (pp. 144–146). It has been shown that 50 per cent. of the isolations from *B. lutea* were a species of *Phomopsis* [see above] while *Melanconium bicolor* [33, p. 138] was isolated most frequently from *B. papyrifera*. Conversely, *M. bicolor* was rarely isolated from yellow birch and *Phomopsis* seldom from paper birch.

The last section of this report surveys the variation within injury classes from year to year in sample trees. R. Pomerleau (pp. 147–149) describes the development of die-back in test trees and stands. During more favourable climatic conditions affected trees have been known to recover and only physical factors, more especially unbalanced water, can produce extensive dying. The most urgent need is an investigation of the reactions of all trees to their environment and their physiological and histological changes on being placed in unfavourable conditions. The variation within injury classes from year to year in sample trees is tabulated by G. W. Barter (pp. 150–155). V. S. Jensen (pp. 156–158) discusses the recovery of birch after partial cutting. This treatment increased the rate of growth of yellow birch but had little effect on paper birch. D. Crosby (pp. 159–162) surveys the variation within injury classes from year to year in the north-eastern States, the general trend being a deterioration in the condition of birch, while R. Martineau (pp. 163–166) does the same for white birch in Quebec. From 1948 to 1951 4 per cent. (of 223 white birch) improved in condition, 11·2 per cent. remained in the same class, and in 84·8 per cent. die-back progressed. G. A. Sinclair and A. W. Hill (pp. 167–178) contribute a study of the condition of birch in Ontario. From the results presented it is shown that yellow birch in the province is declining at a greater rate than other hardwood trees on the same sites. This decline is slow but progressive, and appears to be aided by *A. anxius* and *Phomopsis* sp., although these agents are not primary factors in the deterioration.

Redmond (D. R.). **Increased soil temperatures cause rootlet mortality in Yellow Birch.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 10, 3, p. 1, 1954.

All attempts to find a causal organism responsible for die-back of yellow birch

in the Maritime Provinces of Canada [*R.A.M.*, 33, p. 389 and preceding abstract] have proved unavailing. The optimum temperature for root and shoot development in seedlings grown aseptically under controlled temperature conditions was in a narrow range centred at about 18·5° C. When the roots were inoculated with mycorrhizal fungi the optimum development of mycorrhiza also occurred at this temperature. At lower or higher temperatures leaf development was retarded and rootlet mortality increased; where mycorrhiza were present they were less frequent and their development was poorer.

When artificial heat was applied by means of a greenhouse soil-heating electric cable to the feeding roots in a small area of 55-year-old healthy yellow birch from 3rd June to 6th September, 1953, it was found that increasing the soil temperature by 1° and 2° resulted in mortalities of the feeding roots of 19 and 59 per cent., respectively, compared with 6 or 7 per cent. under normal conditions, while a rise of 5° increased the death rate to 97 per cent. at the end of the season. A few sugar maple [*Acer saccharum*] roots in the area, usually with about 1 per cent. dead rootlets, were not affected until the soil temperature was raised by 4° or more.

The moisture content of the heated soil did not fall significantly below that of unheated soil until about the sixth day after rain had replenished the supply to field capacity, and at no time did it approach the wilting coefficient. The increased mortality of yellow birch rootlets would appear to have been caused by increased soil temperature, and not by drying of the soil.

Laboratory experiments with fungi commonly associated with yellow birch rootlets demonstrated that those forming mycorrhiza were markedly reduced in growth rate by heating to temperatures over 20°, while at least one other, which was antagonistic towards these and non-mycorrhizal fungi, was greatly favoured in its growth rate by the higher temperatures. This fungus inhabits rootlets that have recently died. The summer mean daily temperature in Nova Scotia has recently increased by 1° and that of New Brunswick by 1·3°.

Toole (E. R.) & Huckenpahler (B. J.). **Yellow-Poplar dieback.**—*Plant Dis. Reptr*, 38, 11, pp. 786–788, 1 fig., 1954. [Multilithed.]

A die-back of unknown origin caused the death of yellow poplar (*Liriodendron tulipifera*) in the Tallahatchie Experimental Forest near Oxford, Mississippi, in 1953 and again in 1954, when it was more widespread and also occurred in other areas in the State. A species of *Myxosporium* was found fruiting on some dead twigs. An unidentified fungus, consistently isolated from the margin of living and dead tissue of diseased twigs, caused cankers to form on wound-inoculated saplings and was re-isolated.

Black (R. L.). **Radulum casearium, a Poplar decay fungus.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 9, 4, p. 3, 1953.

In a study of the decay of trembling aspen in northern Ontario, *Radulum casearium* [*R.A.M.*, 32, pp. 519, 520] was found to be responsible for over 20 per cent. of all cull losses due to decay. In Manitoba the figure was even higher.

The optimum temperature for growth of *R. casearium* was 30° C.; above 35° growth declined steeply and was only slight at 5°. Growth of *R. casearium* continues after the infected tree has been cut down. The optimum pH for growth was between 5·1 and 6, with slight growth above and none at 3 or less.

Verneau (R.). **Sterilizzazione parziale delle doghe di Castagno da esportazione.** [Partial sterilization of Chestnut staves for export.]—*Ann. Sper. agr.*, N.S., 7, 2, pp. 539–545, 1953. [English summary.]

In experiments at the Phytopathological Observatory for the Campania, Portici,

Italy, on the disinfection of staves intended for export, made from chestnut trees infected by *Endothia parasitica* [*R.A.M.*, 34, p. 327], the fungus was killed by exposure to a temperature of 75° C. for 30 minutes in a very moist atmosphere or to 85° for one hour in a dry atmosphere.

POMERLEAU (R.). **Dutch Elm disease in the Province of Quebec.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 9, 2, p. 2, 1953.

In May, 1952, some 350 elms growing at Cap-de-la-Madeleine, Quebec, in a locality where 15 trees had already been killed by *Ceratostomella ulmi* [*R.A.M.*, 33, p. 390] and cut down, were sprayed before bud opening with a mixture of 10 lb. DDT, 2 gals. xylene, and ½ pint triton X-100 in 100 gals. water [cf. 30. p. 439]. During the ensuing summer eight elms on the estate and one in the town were found to be infected; all were eradicated immediately. The work is to be repeated.

HOFFMAN (P. F.). **Physiology of Chalara quercina H. and chemicals for control of Oak wilt.**—*Iowa St. Coll. J. Sci.*, 27, 2, p. 187, 1953.

Some of the information in this paper has already been noticed from another source [*R.A.M.*, 32, p. 110]. Under field conditions the oak wilt fungus, *Chalara quercina*, persisted for over nine months in felled logs of *Quercus ellipsoidalis* and was recovered from oven-dried red oak twigs having a moisture content as low as 17 per cent. The toxin produced by the pathogen appeared in liquid media in approximately eight days and continued to increase through the twenty-fourth day. Maximum growth was obtained at pH 4·2 and 5·1 and maximum toxin production at pH 3·4 and 4·2. The optimum temperature for growth in liquid culture was 23° to 26° C. Potato starch as a source of carbon promoted the best growth, d-fructose the most toxin, and asparagine was superior to ammonium nitrate as a source of nitrogen.

JØRGENSEN (E.). **Fra Bregentveds Egeskove. Modstandsevne imod svampeangreb hos bredringet og smalringet Egekaerne.** [From the Oak forests of Bregentved. Capacity for resistance to fungal infection in broad- and narrow-ringed Oak heartwoods.]—*Dansk Skovforen. Tidsskr.*, 38, 6, pp. 452–466, 2 figs., 1 graph, 1953. [English summary.]

In observations on the comparative resistance to infection by *Coniophora cerebella* [*C. puteana*] and *Polyporus sulphureus* of the heartwood of fast- and slow-grown oaks in the forests of Bregentved, Denmark, no difference in this respect could be detected between the two groups. In all the trees the inner heartwood sustained heavier damage than the outer, the loss of weight due to *C. puteana* after eight months being 16·6±1·8 and 6·6±1·1 per cent., respectively, while the corresponding figures for *P. sulphureus* were 7·7±1·5 and 4·5±0·7 per cent., respectively. Contamination by *Chaetomium globosum* prevented an assay of sapwood decay by the two wood-rotting fungi.

SATÔ (K.), ÔTA (N.), & SHÔJI (T.). **Experiments on the control of Septoria leaf-spot of Alnus seedlings by fungicides, with special reference to effects of spraying fungicides upon the growth of seedlings.**—*Bull. For. Exp. Sta., Meguro* 77, pp. 15–20, 2 pl., 1955. [Japanese, with English summary.]

At the Government Forest Experiment Station, Meguro, Tokyo, seedlings of alder (*Alnus firma*) affected by leaf spot caused by *Septoria alni* [cf. *R.A.M.*, 14, p. 396] were stunted in growth and had weaker stems than healthy ones. Among a number of protective fungicides tested on diseased seedlings Bordeaux mixture (1–1–25) alone or with 0·1 per cent. uspulun was very effective in controlling the leaf spot, the growth in height for the former being 36·8 cm. and 'index of injury' 52·2 and

for the latter 32·4 cm. and 57·4; dithane was fairly effective (35·2 cm. and 65·2), and Sankyo-Bordeaux little better than the unsprayed (23·2 cm. and 73·4).

Satô (K.), Ôta (N.), & Shôji (T.). **Relation between weeds and damping-off of coniferous seedlings caused by Rhizoctonia solani in forestry nurseries.**—*Bull. For. Exp. Sta., Meguro* 77, pp. 1–14, 16 figs., 1955. [Japanese, with English summary.]

Observations in nurseries of coniferous seedlings in Japan revealed that the incidence of damping-off due to *Rhizoctonia* [*Corticium*] *solani* [cf. *R.A.M.*, 33, p. 512] was most severe in warm weather with high relative humidity when the seedlings were surrounded by a dense growth of weeds, many of which were attacked by the fungus. The incidence of *C. solani* on *Cryptomeria japonica* seedlings was reduced in the more frequently weeded plots. Little difference was observed in the susceptibility of *Pinus densiflora* and *P. thunbergii* seedlings to individual strains of *Corticium solani*, though there was a wide range in pathogenicity among various isolates of the pathogen. The writers did not find that the isolates were most virulent on the host from which they were obtained. Some strains of *C. solani* were shown to be pathogenic to *Digitaria ciliaris*.

Itô (K.) & Hosaka (Y.). **Gray moulds of Japanese Larch (Larix kaempferi Sarg.) seedlings.**—*Bull. Govt For. Exp. Sta., Meguro* 59, pp. 33–44, 3 pl., 4 figs., 1953. [Japanese, with English summary.]

Work at the Laboratory of Forest Pathology, Government Forest Experiment Station, Tokyo, on grey mould of Japanese larch (*Larix kaempferi*) seedlings, has shown that the most important causal fungus of the disease is *Botrytis cinerea* [*R.A.M.*, 31, p. 582] but a distinct *Botrytis* sp. is also found occasionally. The disease is common on Japanese larch seedlings from late spring to early autumn.

Vaartaja (O.). **Disease caused by weak parasites associated with shade in seedbeds.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 9, 2, pp. 3–4, 1953.

About one-quarter of the two-year-old and many three-year-old seedlings of Scots pine in nursery beds at Indian Head, Prairie Provinces, Canada, in 1952 were killed in patches and more developed abnormally. Many needles were killed, often mostly on one side of a plant, and frequently the tip of the seedling was dead and the stem swollen. Occasionally, buds, branches, or needles were abnormal. The disease occurred only in heavy shade, lack of sufficient light apparently weakening resistance to attack by weak parasites [cf. *R.A.M.*, 32, p. 407]. Isolations from diseased stems gave *Fusarium moniliforme* [*Gibberella fujikuroi*], *F. acuminatum*, *Dematium* [*Pullularia*] *pullulans*, *Alternaria* sp., and *Helminthosporium sativum*. Further work is in progress.

Vaartaja (O.). **'Red patch' disease in seedbeds.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 9, 4, p. 3, 1953.

During the period 1949 to 1953 a red discoloration of spruce (*Picea glauca*) seedlings occurred at the Big River [Saskatchewan] nursery [*R.A.M.*, 32, p. 664 and next abstract] after the snow had melted. The affected needles gradually turned from rusty red to brown and grey on the twigs, large patches of affected seedlings being conspicuous in the seedbeds. A whitish mould growing in snow was associated with the disease, which was capable of killing needles, twigs, and small seedlings. The number and size of the red patches increased every spring.

Experimental evidence demonstrated that the disease spread directly from both dead seedlings and living ones bearing infected needles; it advanced across a gap of 4 in. from which all seedlings had been removed. Isolations from affected material

gave several fungi, some of which grew well at 0° and 7° C. Fruiting bodies of *Phacidium infestans* [cf. *R.A.M.*, 30, p. 202] were not found.

VAARTAJA (O.). **'Red-patch' disease and its control.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 10, 3, p. 3, 1954.

In 1953–4 'red patch' disease of spruce (*Picea glauca*), associated with an unidentified snow mould [see preceding abstract], recurred at the Big River Nursery, Saskatchewan; 22 new patches covering a total area of 5 sq. ft. appeared and the previous patches had enlarged. Of a number of fungicides (at the rate of 100 lb. per acre) sprinkled on the patches, only semesan gave effective control, spread being virtually arrested. Infection experiments indicated that the snow mould grows slowly from affected to healthy seedlings.

Current activities.—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 9, 1, 4 pp., 1 graph, 1953.

W. K. MCGINN states that a survey of 560 acres of white pine [*Pinus strobus*] in southern Nova Scotia typical of the region disclosed an average of 0·4 *Ribes* plants per acre, with an average infection rate of blister rust [*Cronartium ribicola*: *R.A.M.*, 33, p. 139 and next abstract] of 0·1 plants per acre.

D. M. MACLEOD isolated strains of *Beauveria bassiana* from 63 different insect species belonging to several families, collected in all parts of Canada except Prince Edward Island and Newfoundland. Under field conditions the artificial dissemination of spores of the fungus on to feeding *Pristiphora erichsonii* larvae failed to produce a significant increase in infection. Better results were obtained when the spores were applied as a ground spray just before the larvae dropped to the ground to form cocoons.

Comparative studies of cultural and physiological characteristics of 16 isolates of *Fomes annosus* [33, p. 512] from various localities and hosts in North America and Europe by D. E. ETHERIDGE indicated that no consistent differences are to be found between the two groups.

A. K. PARKER states that since the discovery of a disorder resembling pole blight on western white pine [*Pinus monticola*] in the coastal region of British Columbia in 1951 [32, p. 42], a species of *Leptographium* [32, p. 408; 33, p. 456] has been isolated from 100 of 132 lesions on 27 trees sampled in that area. Of 149 trees (40 to 100 years old) inoculated with *L.* sp. during the past three years none has developed crown symptoms. All have developed resinosis above and below the inoculation sites. In many instances more lesions developed after inoculation than were found on naturally affected trees.

The data so far obtained indicate that lesions similar to those on naturally blighted trees are produced by the fungus; trees from one to at least 175 years old are susceptible; roots and all parts of the trunk are susceptible; wounding is necessary before infection; and there are no consistent differences between isolates from the coast and those from the interior. Considerable doubt remains whether *L.* sp. is the sole cause of the disorder.

DAVIDSON (A. G.). **White Pine blister rust in Newfoundland.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 9, 4, p. 2, 1953.

In an extensive survey for blister rust [*Cronartium ribicola*] on white pine [*Pinus strobus*] in Newfoundland [cf. preceding abstract] in June, 1953, samples of the fungus were collected from Stephenville Crossing in the west to St. John's in the east, and from as far north as Lomond, Hampden, and Springdale. The pines observed were for the most part heavily infected, particularly in the central region of the island, where most were either dead or had dead tops with many dead branches. The *Ribes* population is very high in Newfoundland.

Davidson (A. G.) & Newell (W. R.). **Pathological deterioration in wind-thrown Balsam Fir in Newfoundland.**—*For. Chron.*, 29, 2, pp. 100–107, 6 figs., 1953.

This is an enlarged account of results obtained from an examination of wind-thrown *Abies balsamea* trees in Newfoundland, the essentials of which have already been noticed [*R.A.M.*, 32, p. 518 and following abstracts]. Approximately one-third of the total merchantable volume was affected by incipient decay, due primarily to *Stereum chailletii* [loc. cit.] and occasionally to *S. sanguinolentum* [loc. cit.], but the material could still be used in the manufacture of pulpwood. A complete loss was caused by advanced brown cubical rot, *Lenzites sepiaria* [loc. cit.], in 1 per cent. of the fallen timber.

Davidson (A. G.). **Decay of Balsam Fir.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 9, 4, p. 2, 1 graph, 1953.

During the period 1949 to 1952, examination of approximately 3,450 living balsam fir [*Abies balsamea*] trees in six areas in eastern Canada for cull due to [unspecified] decay [*R.A.M.*, 33, p. 60 and preceding and next abstracts] showed that the effect of age (61 to 120 years) on the percentage of cull was essentially the same in the four mainland areas sampled (three in northern New Brunswick and one in central Nova Scotia) and was a simple straight-line relationship. Any difference between the areas disappeared when the means were adjusted to common age. Age had a less marked but similar effect in western Newfoundland and the highlands of Cape Breton Island: after adjustment for age, however, the percentage of cull in the trees from the former was significantly lower than in those from the latter. The percentages of cull in trees from these two areas were also significantly lower than in the mainland samples.

Davidson (A. G.), Newell (W. R.), & Cochrane (R. H.). **Decay of Balsam Fir in the Maritime Provinces of Canada.**—*Pulp Pap. (Mag.) Can.*, 55, 9, pp. 135–137, 141–142, 144, 3 graphs, 1 map, 1954.

An extensive examination of living balsam fir (*Abies balsamea*) in the Maritime Provinces of Canada [see preceding abstracts] has revealed differences between geographical localities in the incidence of decay. In some cases the variations were attributable to differences in the ages of the trees, but in others no cause has yet been found. Among other factors which might be expected to influence the amount of decay are the different species of fungi involved, rate of tree growth, stand density, composition, and history, genetic differences within the host species, and climatic and environmental conditions, and further studies on their relative importance are essential.

Stereum sanguinolentum, *Corticium galactinum*, *Odontia bicolor*, and *Coniophora puteana* were isolated from diseased trees in all the seven localities investigated, *Armillaria mellea* and *Polyporus balsameus* in six, *Poria subacida* and *Omphalia campanella* in four, and *Merulius himantioides* in three.

Savory (J. G.). **Breakdown of timber by ascomycetes and fungi imperfecti.**—*Ann. appl. Biol.*, 41, 2, pp. 336–347, 1 pl., 1954.

Investigations at the Forest Products Research Laboratory, Princes Risborough, Bucks, of the surface deterioration of timber in water-cooling towers [*R.A.M.*, 33, p. 571] showed that soft rot, that is, the decay caused by cellulose-destroying microfungi, to distinguish it from the brown and white rots caused by wood-destroying basidiomycetes, is usually superficial. Deep penetration occurs only in wood not continually waterlogged, and even then severity progressively decreases with depth. Sections of submerged softwoods, irrespective of the species of timber, usually show a central core of sound wood, often containing sap-stain fungus

hyphae, some of which stain in picro-aniline blue, a characteristic of young hyphae; a zone of attack where the wood appears to be sound, but a few hyphae grow spirally within the tracheid walls of the summer wood, where there are chains of cavities with pointed ends [cf. 17, p. 87]; and an outer zone, usually sharply differentiated, where the wood is severely decayed and breaks away readily. In hardwoods visible attack is confined to fibres and, to a smaller extent, the rays. Zones are not so clearly distinguishable, but in other respects the attack resembles that in softwoods. Soft rot is of general occurrence in waterlogged wood, and has also been found in fence posts, logs, and sawn timber. It was found in eight species of softwoods and 19 of hardwoods, and in both types it was present in the heartwood of timbers known to be very resistant to fungal attack. In all, five ascomycetes, four imperfect fungi, 19 incompletely named species, and five sap-stain fungi were isolated from soft-rotted timber. The fungus most frequently isolated was *Chaetomium globosum* [33, pp. 60, 571].

The timber filling of a large water-cooling tower may cost £10,000 to £20,000 to install, and soft rot in such structures is, therefore, of considerable economic importance. It was found in the surface of all cooling-tower slats examined, including many which had received preservative treatment and some which had been in service for only nine months. Rot caused by basidiomycetes occurs occasionally in the wooden chimney of older towers and in wooden troughing used to carry water within towers, but was noted once only in slats. Soft rot always occurs on the inner surface of linings of wooden chimneys, but has not led to replacement of the wood in periods of up to 45 years' service.

Different types of timber breakdown often occur in the same tower, and their effects are usually complementary. Soft rot, however, is considered to be the primary cause of deterioration and loss of strength of slats in most cooling towers in Britain. It is unimportant in structural timbers of large cross-section, in which decay due to basidiomycetes has more significance. The effects of erosion are increased by surface weakening of the wood by soft rot.

Preservative treatment will prevent decay by basidiomycetes in structural timbers wetted only occasionally, and should prevent decay of the slats if the towers are not constantly used.

Itô (K.), Shibukawa (K.), & Terashita (T.). **Etiological and pathological studies on the needle blight of Cryptomeria japonica II. Physiological and ecological characters of Cercospora cryptomeriae Shirai, the most important pathogen of the disease.**—*Bull. For. Exp. Sta., Meguro* 76, pp. 27–61, 1 pl., 10 figs., 1954. [Japanese, with English summary.]

In further studies on the needle blight of *Cryptomeria japonica* at the Government Forest Experiment Station, Meguro, Tokyo, Japan [*R.A.M.*, 33, p. 327], very few conidia of the chief pathogen of the disease, *Cercospora cryptomeriae*, could be found out of doors from November to February. Conidia formed in the late autumn were different in shape and form from the spring and summer conidia and they survived for six months when kept dry in the laboratory or overwintered out of doors protected from wind and rain. Mature spermogonia were found either within old conidial stromata or growing independently, usually in December, but the perfect state has not been found. In the spring surviving stromata produced abundant conidia which comprised the most important source of primary infections.

Under laboratory conditions the conidia of *C. cryptomeriae* germinated well between 15° and 30° C., and within 92 to 100 per cent. relative humidity but not below 87 per cent. Bordeaux mixture inhibited germination over a wide range of concentrations. In culture mycelial growth ceased below 6° and above 33°, with

an optimum at 20° to 25°; it was unaffected by changes in pH between 4 and 8 in the medium.

Itô (K.) & Kontani (S.). **Pestalotia parasitic on seedlings of Chamaecyparis obtusa Sieb. et Zucc.**—*Bull. For. Exp. Sta., Meguro* 76, pp. 63–72, 2 pl., 5 figs., 1954. [Japanese, with English summary.]

In comparative studies with species of *Pestalotia* isolated from blighted *Chamaecyparis obtusa* seedlings at the Government Forest Experiment Station, Meguro, Tokyo, Japan, two isolates were identical with *P. chamaecyparidis*, a third was similar to *P. funerea*, while a fourth appeared to be new. *Pestalotia* was able to infect the seedlings only through wounded tissue.

Aoshima (K.) & Hayashi (Y.). **Durability of brown and blue-stained Beech wood.**—*Bull. For. Exp. Sta., Meguro* 76, pp. 21–26, 1 diag., 1954.

During the warm summer months beech (*Fagus crenata*) [*F. sieboldii*] logs in the temperate region of Japan are rapidly stained brown by *Endoconidiophora bunae* [*R.A.M.*, 16, p. 577] or blue by *Ceratostomella piceae* (*J. Jap. For. Soc.*, 35, pp. 268–269, 1953). In view of the difficulty of controlling these staining fungi, experiments were designed to test the durability of affected timber. Oven-dried test blocks (1 by 1·5 by 3 cm.) from beech sapwood were placed on a sawdust medium and inoculated with *E. bunae* and *C. piceae*. When discoloured, the test blocks were sterilized at 15 lb. pressure for 30 minutes and inoculated with nine common, Japanese, beech wood-rotting fungi.

Differences in durability, as measured by loss of weight, between stained and sound wood blocks, were apparent with three of the fungi. Stained blocks were significantly more resistant to *Trametes cinnabarina* [cf. *R.A.M.*, 32, p. 291] and *Armillaria japonica*, while sound wood was more resistant to *Coriolus* [*Polystictus*] *consors* than wood stained by *Ceratostomella piceae*. For the other six species no significant differences were found between sound and stained blocks.

Nagai (Y.), Aoshima (K.), & Hayashi (Y.). **Laboratory test on the durability of Beech wood felled at different seasons.**—*Bull. For. Exp. Sta., Meguro* 77, pp. 21–23, 1955. [Japanese, with English summary.]

At the Government Forest Experiment Station, Meguro, Tokyo, sapwood test blocks (1·5 by 1 by 3 cm.) taken from comparable logs of beech (*Fagus crenata*) [*F. sieboldii*] cut every month from May, 1951, to May, 1952, were placed on a sawdust and rice-bran medium, sterilized, and inoculated with *Daedaleopsis* [*Daedalea*] *tricolor*, *Coriolus* [*Polystictus*] *hirsutus*, *Polyporellus* [*Polyporus*] *brumalis*, *Lenzites betulina*, and *Armillaria mucida*. After a suitable period (three months for *L. betulina* and four for the other test fungi) it was concluded from the percentage loss in weight that the time of felling exerts no influence upon the resistance of beech sapwood to these wood-rotting fungi. *Polystictus hirsutus* and *D. tricolor* were most active in decay and *A. mucida* and *Polyporus brumalis* the least.

Ohashi (H.). **Studies on Panus stipticus and Trogia crispa.**—*J. Jap. For. Soc.*, 34, pp. 220–223, 1952. [Abs. in *Rec. Res. Fac. Agric. Tokyo Univ.*, 3 (*1952–1953*), p. 74, 1954.]

After ten months test blocks of beech (*Fagus crenata*) [*F. sieboldii*] inoculated with *Panus stipticus* showed a decrease of from 27 to 38 per cent. of the dry weight in the upper parts and 0·2 to 2 per cent. in the lower. Similar blocks of *Chamaecyparis obtusa* inoculated with *Trogia crispa* lost 8·4 to 9·5 per cent. and 0·2 to 2·2 per cent. in the upper and lower parts, respectively. The optimum temperature for the growth of both fungi was 25° C.

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